

AMERICAN FRUIT GROWER

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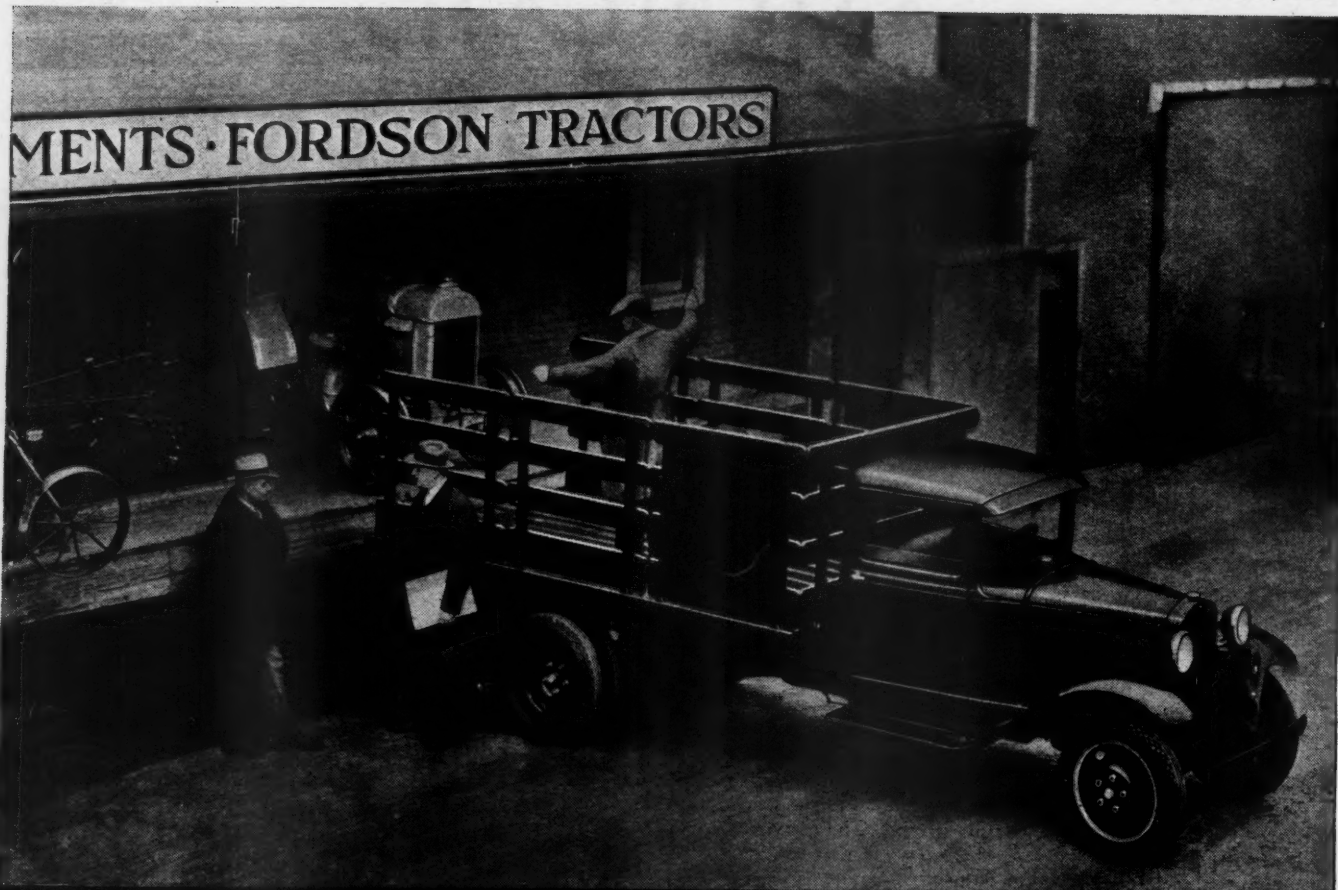
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Reliable, economical Ford transportation *to aid your spring work*

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ASK YOUR DEALER ABOUT THE IMPROVED FORDSON TRACTOR

CRAMPING THE FRUIT WORM'S STYLE

By R. B. Neiswander

ORIENTAL FRUIT MOTH parasites were more active in Ohio during the season of 1931 than ever before. When a parasite has deposited an egg on the larva of a fruit moth this egg hatches into a worm that bores into the fruit moth and starts feeding. The fruit moth larva, however, continues feeding, perhaps more ravenously than usual, until it is full grown, and may even spin a cocoon. The parasite continues to grow until it has devoured all of the fruit moth except the skin. Consequently the adult parasite instead of the adult fruit moth finally emerges from the cocoon.

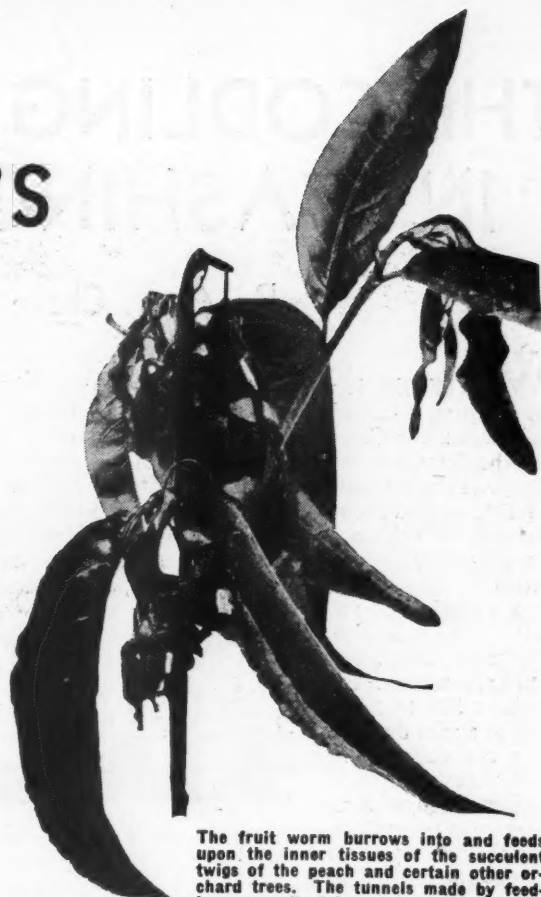
Thus by collecting twig feeding fruit moth larvæ at frequent intervals from various orchards of the State, and rearing them to maturity in cages, the insect enemies or parasites that are working can be determined.

The average parasitism of twig feeding larvæ in Ohio during 1931 was more than twice that of other years. An important point was established in showing that five of the most common native parasites are not dependent on the oriental fruit moth. These parasites were reared from the larvæ of a ragweed borer. This, of course, means that

should the parasites succeed in reducing the fruit moth population to small numbers, they would not necessarily starve out themselves by destroying their own food supply, which would be the case if they had no other host.

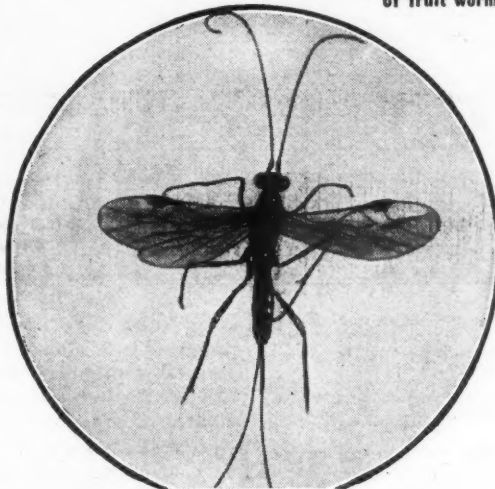
During the seasons of 1930 and 1931 a total of 15,757 individuals of the oriental fruit moth parasite *Macrocentrus ancylivorus* were imported from Riverton, N. J. These were liberated in vigorously growing peach orchards in 15 counties of Ohio.

This parasite shows promise of becoming an important factor in the control of the oriental fruit moth. It had not been taken in Ottawa county before liberations were made there in 1930 and only occasionally was it found in other parts of the State. A summary of the collections made in 1931 indicates that the imported species is now the most common parasite found in this county. Fifty-five per cent of all the larvæ collected

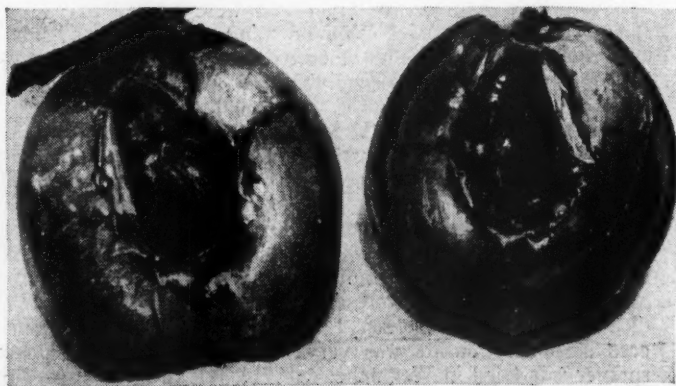


The fruit worm burrows into and feeds upon the inner tissues of the succulent twigs of the peach and certain other orchard trees. The tunnels made by feeding may extend from one and one-half to six inches. As the wood hardens the worms transfer their activities to the fruit, burrowing into and feeding upon the pulp.

In Circle.—*Macrocentrus ancylivorus*, most important parasite of fruit worm.



Below.—Peach split open to show fruit worm feeding on pulp.



during the season were parasitized and approximately 45 per cent of this number were the imported species. Evidence of establishment was obtained during both 1930 and 1931 from each point of liberation and collections taken from two orchards each three-fourths mile from the nearest point of liberation yielded a high percentage of the imported species.

Approximately the same condition is true of all of the northern counties. Collections were made in Lake and Cuyahoga counties, and these collections averaged 82 and 83 per cent parasitized larvæ, respectively.

Macrocentrus ancylivorus apparently has become much more active in northern than in southern Ohio.

Although liberations were made in several of the southern counties in 1930 and several individuals were recovered that season, none were recovered in 1931. Undoubtedly the drought of 1930, together with the failure of the peach crop in central and southern Ohio, which greatly reduced the fruit moth population in these areas, had some influence on the welfare of the parasites. This leads one to speculate concerning what may happen in the future in areas where the parasites have become thoroughly established. We hope, however, that other host larvæ may tide the parasites over the period of scarcity of the oriental fruit moth larvæ.

One of the principal causes of the variations that appear in fruit moth infestations is the variation in the number of larvæ carried over winter from the previous year. This factor is partially determined by the climatic conditions. Studies made during the spring of 1930 in northern Ohio indicated a winter mortality of 80 per cent, whereas a similar study made in 1931 showed a mortality of (To page 20)

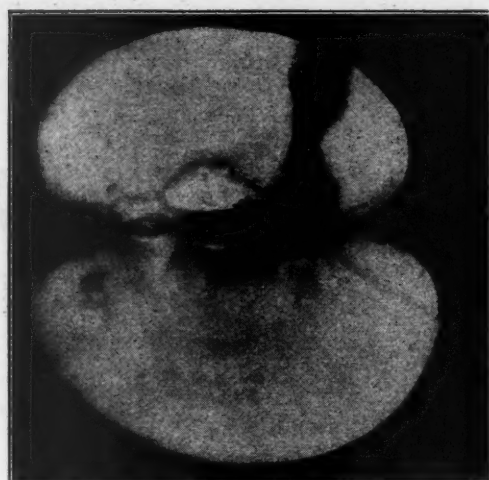
THE CODLING MOTH IN WASHINGTON

By A. R. Chase

WHATEVER it was that introduced the codling moth into the State of Washington, it caused more damage than did the cow that kicked over the lamp and started the Chicago fire. The total cost of spraying for the codling moth and the damage wrought by the insect in this district cannot be accurately computed. It is estimated that the Wenatchee district used 4,500,000 pounds of arsenate of lead per season, and probably two-thirds as much is used in the apple orchards of Yakima. It is safe to say that these two valleys now use approximately 8,000,000 pounds of arsenate of lead per season, equivalent to some 200 carloads. In addition to arsenate of lead, other materials, such as oils, are used to a considerable extent. There is also the production, labor and harvesting bill for perhaps 500 to 1,500 cars of apples dumped into the cull pile in each valley.

These figures look somewhat menacing and they do represent expenditures of \$5 to \$75 per acre for the control of this pest each year. Adding to these figures the cleaning expense of one to two cents per box, it is easy to realize that this pest costs our fruit growers millions of dollars each year.

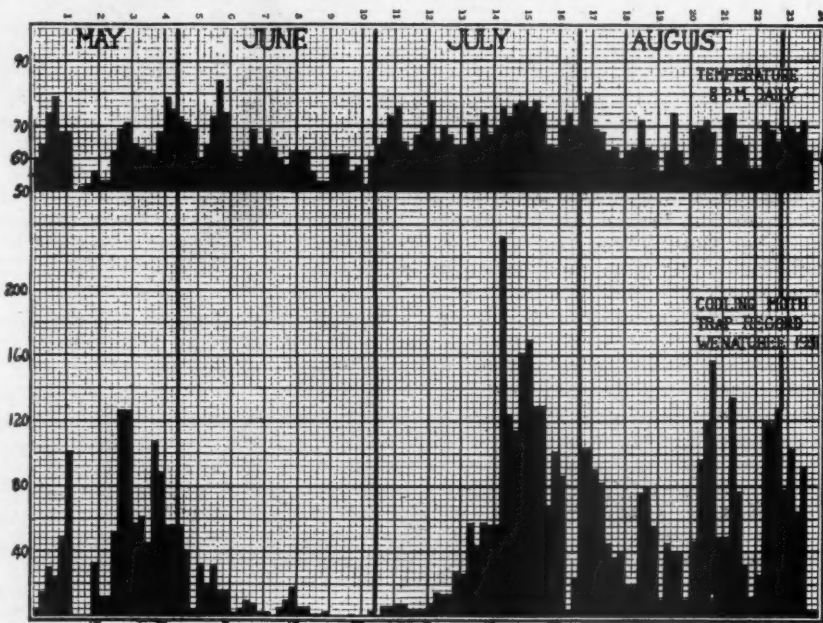
Since the codling moth is our outstanding pest, we have naturally specialized on its study and many combinations of spray and control measures are constantly being tried out, every or-



The larva of the codling moth is the bête noire of the northwestern fruit grower, costing \$5 to \$75 per acre for control.

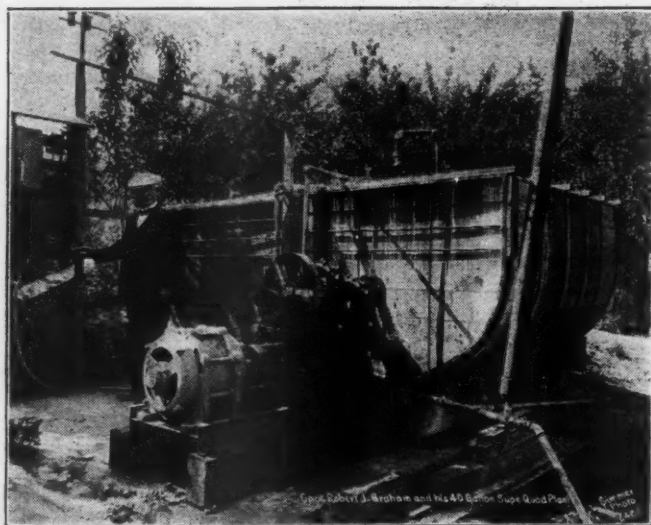
chard serving as a laboratory for the purpose. While in some seasons we gain in the fight and in others we slip back, general knowledge concerning the codling moth has increased year by year.

Yakima and Wenatchee valleys both lie in the semi-arid section east of the Cascade mountains with rainfall varying from six inches in the driest portion to 15 or 18 inches next to the mountains. In both districts the orchards were largely set on sage brush or pine land, and most of the good orchards are on deep bench soils, rich in plant food. Irrigation is the universal practice. It has been found that yields in these valleys fluctuate



Above.—The upper graph shows the daily temperature readings at 8 p.m. In the lower graph the daily trap records may be compared with the chart above.

Below.—A typical stationary spray plant installation.



about the same from year to year. Insect problems and soil problems are similar and the cultural methods used and the marketing problems encountered are practically identical.

The Wenatchee district, including the four counties of north central Washington with which this article directly deals, started with two carloads of apples in 1902 and shipped over 24,000 cars in 1930. Yakima shipped over 18,000 cars the same year.

In the few years succeeding 1910 when orchards were first coming into bearing most of the trees were comparatively young, low, well spaced, easy to reach and clean cultivated. By 1920, however, they had grown larger and were harder to spray. About that time extensive cover cropping of alfalfa was beginning to be practiced. The older trees being harder to reach, having rough bark and providing a greater number of hiding places for overwintering larvæ, the codling moth problem became more acute. During the last five years a tendency toward drought conditions with excessively hot summers has made control of the codling moth exceedingly difficult, especially in the lower valley.

Wenatchee was the first orchard district in the world to adopt stationary sprayers on an extensive scale. When the growers learned they could cut labor costs, expedite spraying, obtain higher pressure and better results, avoid tearing down irrigation ditches and packing the soil, the change to modern high powered stationary outfits was very rapid. The first stationary sprayer was tried in Wenatchee in 1916, but the (To page 27)

GETTING six acres of apple orchard with a land purchase of 18 acres was only an incident in the life of J. W. Carter, but it turned out to be the foundation of his successful commercial orcharding of today.

In the hills just east of Glenwood, Iowa, Mr. Carter, with Edwin Carter, his son, for a partner, handles more than 100 acres of bearing trees. Included are about 4400 apple trees, most of them in bearing, and some 1500 peach trees. And the orcharding is additional to the general farming and live stock raising that the Carters do on a separate 500 acres.

"I didn't think much about the six acres of apple trees when I got them in the 18-acre farm land deal," said Mr. Carter, when he was questioned about his orcharding start. "But the very next season they bore such a crop that the income from them was \$3000. So I was inspired to set more trees. I had a good deal to learn, but some of the knowledge was acquired by inviting the State extension specialists to carry on some of their experiments among my trees. Then other lessons were learned by our own hard and fast practice, and watching the results."

The market for the Carter apples has never been a problem. It never is a problem in a country where practically the whole trend is to grain and live stock. The farmers from everywhere come to buy the fine fruit, and likewise the folks of the towns drive in. What does not pass out this way finds ready acceptance by the wholesale men of Council Bluffs and Omaha, not more than 20 miles distant, with hard paving all the way. So it has been other problems than marketing with which Mr. Carter and Edwin have been concerned.

There was tree formation, for instance. "We made mistakes in heading them out in some cases, and these same mistakes are not being made in the new settings," said Mr. Carter. He approached a four-year-old. How nicely the central leader branch was developing.

The little scaffold limbs were quite evenly spaced along this central leader, which means that in years to come they will not have a tendency to split away from each other, as trees incorrectly headed have a habit of doing.

For correction of the old mistakes, Mr. Carter uses wire bracing between scaffold limbs that show danger of separating. Either screw eyes are the holders of these wires, or the wires are bound about the circumference of the tree a little above the heading out point on the trunk.

It is a low headed tree that is the preference for tree style in this hundred-acre orchard. Low headed trees make easier



Mr. Carter and Reuben Burquist, the county agent, examining the young trees.

UP FROM SIX ACRES

By George R. Harrison

harvesting, and are less affected by the winds. Some of the Carter trees branch out only a few inches above ground, and still the spread is not so much that there is any serious interference with the tractor cultivation between the rows. With a low set tractor, and a disk harrow, the earth can be loosened within a foot of the tree trunks. Then to make the cultivation complete, the Carters and their men use common garden hoes to dig up that portion out of reach of the disk.

Cultivation of the trees used to be a bother when horses had to be used. And ordinary farm tractors stood too high in the air, interfering with the branches. Then came the low-set crawler type tractor, and the Carters bought one. This type

of tractor can turn around within its own length, which is another fine advantage. And using the same tractor as power for the spray outfit enables the men to spray 25 acres a day with 4000 gallons of liquid spray mixture. While one crew sprays, another mixes the batches and hauls them to location.

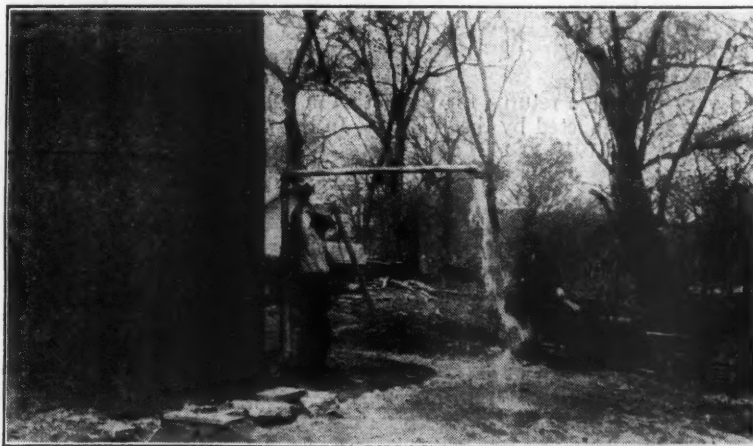
The orchard sprayer for the combination is provided with power takeoff, and so at the same time the tractor propels the sprayer along the rows, it is forcing the spray from four nozzles with pressure of 300 pounds. If there is another man available, two more nozzles can be used with the pressure remaining at the same high pitch.

"With several sprayings in a season being necessary for production of the highest quality fruit, such a powerful sprayer outfit is necessary," says Mr. Carter. His, so far as he can learn, is more powerful than any other in the State.

Since orchards should have cover crops, various kinds were tried but the Carters finally settled down to plain weeds, mainly foxtail, that volunteers so nicely. And while this may sound strange to those not versed in orchard ways, the fact remains that experiments as carried on by

the Iowa extension department in the part of the State where the Carters reside, showed conclusively that weeds are second only to red clover for cover crop efficiency. And counting on the way red clover kills out, and the expense of frequent seeding, the weeds are really to be preferred.

"Our last trial with a domestic cover crop was with Hubam," said Mr. Carter as he began to detail his cover crop methods. "But the Hubam was not nearly a dense enough growth. After it died in the fall, there wasn't the mass for a good blanket. Furthermore, it is deep rooted, and so takes lots of moisture that ought to be left for the trees. We have (To page 21)



An old Ford engine pumps water from a spring-fed creek into this big tank from which it is drawn for spraying. Mr. Carter is showing the county agent how it works.



GROW A GARDEN

By T. J. Talbert

THE HOME vegetable garden may be made an important asset to the farm, suburban, or city dweller. Moreover, it offers one of the most valuable means of effecting savings in the family budget. Too many persons make excuses for not raising vegetables and truck crops. It is often considered a trivial matter, and some believe that they can better afford to buy the vegetables needed than to go to the trouble of producing them. The tendency, however, is to not purchase fresh vegetables daily but to do without them and to substitute the more expensive and less wholesome canned or preserved product.

Vegetables also are important from the standpoint of health and growth. Recent investigations have shown that they contain an abundance of mineral salts not found so plentifully in other foods. Growth and health producing substances known as vitamins are found in ample amounts in most of our common vegetables.

A well-kept garden will yield very profitable returns for the time and labor expended. Experiments conducted by the Missouri Agricultural Experiment Station from 1919 to 1921

A well-kept garden will yield very profitable returns for the time and labor expended.

season. These gardens ranged in size from .03 to 2.69 acres. The average cash expense for seed, tools, etc., per garden was \$8.47. All of the 48 gardens averaged .33 of an acre in extent. The average total returns per garden amounted to \$106.45. For the labor expended these gardens paid an average of \$1.38 per hour.

The growing of a vegetable garden may be justified for the following reasons: (1) It can be made to furnish an adequate supply of fresh vegetables from early spring until late autumn, and in addition, all that are required for canning, preserving, and storage for winter use. (2) It supplies vegetables of high quality. (3) Intelligently planned and carried out, the work becomes a source of education and inspiration instead of drudgery and a disappointment. (4) It is a paying proposition in dollars and cents.

In the preparation of the soil, thorough, deep plowing in the fall or early winter is generally advisable. The seed bed should be mellow, deep, rich, well aired, and well drained for best results. Weeds should not be allowed to get a start. Once the garden

An excellent home garden capable of supplying an abundance of wholesome, nutritious foods throughout the year for a family of five.



or truck patch becomes infested with weeds it may often be more expensive to clean them out than the crop is worth. Frequent, thorough cultivation is necessary. If the top surface of the soil is stirred as soon as it will do to work after rains, trouble seldom will be experienced with weeds. Moisture also will be conserved by preventing the ground from cracking. Timely and frequent cultivations will tend to make gardening and trucking not only profitable, but a real pleasure.

The question is often asked, "What vegetables and how much of each vegetable shall I plant?" This is difficult to answer because the likes and dislikes of individuals differ. In some instances a family's liking for a certain vegetable will require a large planting, while another family may omit the crop from their garden. There are, however, certain staple vegetables which are grown in most gardens. The larger table will give an approximate idea of the crops to plant and the amount usually required for the average family.

Too much stress cannot be laid upon the value of a well arranged and well planned garden. This problem should be given consideration some time before spring opens. Generally a profitable and practical garden will have three main parts or divisions: (1) the perennial crops or vegetables such as rhubarb, asparagus, etc.; (2) a division in which crops like melons, parsnips, etc., that occupy the ground all sea-

son will be needed; and (3) a plot or division containing vegetables like radishes and lettuce, which may occupy the ground for only a part of the season.

Since the perennial crops occupy the land for several years, it is more economical and convenient to have them occupy one side of the garden area. In such a location they are not likely to be in the way of plowing or interfere with other operations. When the early-maturing vegetables are grouped together and the crops harvested, a plot of ground will be left for the planting to another crop, which we often term as late vegetables.

In fact, the late crops may prove to be the most valuable of all because many of them may be stored for use through the winter.

Other advantages of having a plan consist of the ability to rotate the crops, thereby eliminating the practice of raising the same vegetable on the same plot for two or more years in succession. It is not difficult, therefore, to plot out on a piece of paper the garden as it should appear before planting. This will enable the producer to determine the amount of seed required, to decide upon the dates of planting, and to make other necessary arrangements and adjustments which should be of value in making the project a success.

For best results the garden or truck patch should be located in such a manner as to receive full sunlight. Trees grow-

ing along the border or buildings close to the garden may shade the soil and crops to such an extent as to materially cut down the yield and quality. It is of equal importance that the garden be located in a convenient place, particularly for the harvest of such crops as lettuce, radishes, onions, etc. This is true because it is often desirable to gather these vegetables and others just before the meal is prepared. For such crops as potatoes, sweet potatoes, cabbage, tomatoes, and others, the plot may be more distant from the house. It is important, however, that all plots be accessible.

A grouping of vegetables which may aid in the arrangement of the garden is suggested:

Crops Occupying the Ground All Season

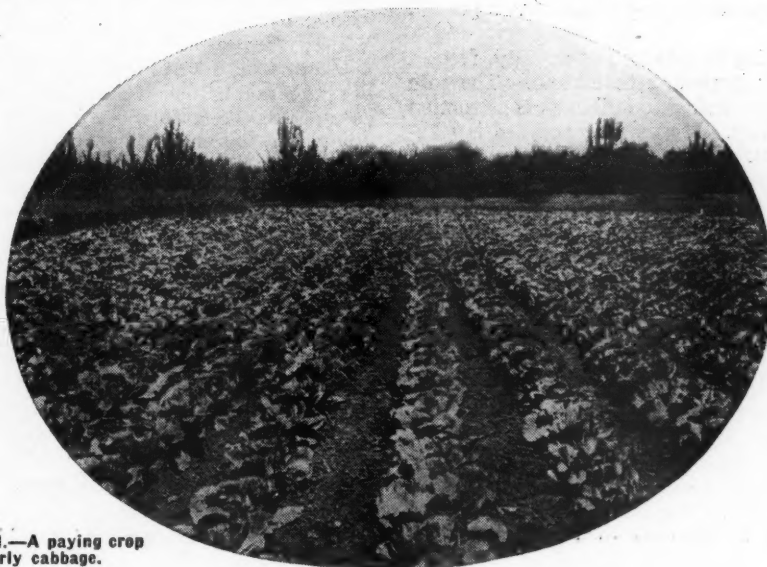
Asparagus	Chard	Parsley
Rhubarb	Cucumbers	Parsnips
Horseradish	Eggplant	Watermelons
Beans, pole, snap	Sweet Potatoes	Peppers
Muskmelons	Okra	Pumpkins
Beans, pole, lima	Onion (from seed)	Salsify
		Squash

Crops Occupying the Ground for Only a Part of the Season and Which May Be Followed by Others

Beans, bush	Cauliflower	Lettuce
Beets	Corn (early)	Turnips
Cabbage	Spinach	Onions (sets)
Radishes	Kale	Peas
Carrots	Kohlrabi	Potatoes

Late Crops Which May Follow Others

Beans, bush	Cabbage (Chinese)	Kale
Beets	Carrots	Lettuce
Cabbage (late)	Corn	Potatoes (late)
Turnips	Celery	Radishes
		Spinach



In oval.—A paying crop of early cabbage.

A SUGGESTED GARDEN TO PROVIDE FRESH, CANNED, AND STORED VEGETABLES FOR AN AVERAGE FAMILY OF FIVE.

Feet of Row	Crop Grown	Variety	Date of Planting	Planting Distance in Inches		Seed or Plants for 100 ft. of Row
				In Row	Between Rows	
150	Asparagus	Mary Washington	April	18	48	66 plants
60	Rhubarb	Victoria	April	48	48	25 plants
800	Potatoes, early	Irish Cob.	Mar. 15-Apr. 15	15	36	6 lbs.
200	Onions	(Sets)	Feb. and March	3	24	3 pts.
50	*Radishes	Icicle, Wh. Tip	Mar., Apr., May	1	24	1 oz.
100	Spinach	Bloomsdale	Mar. or Sept.	3-4	24	1 oz.
50	*Lettuce	Grand Rapids	Mar., Apr., May	4-6	24	1/2 oz.
300	*Peas, early	Alaska	Feb., Mar., Apr.	1	24	1-2 pts.
200	Cabbage	Copenhagen	Mar. 15-Apr. 15	15	30	80 plants
50	Beets, early	Crosbys Egypt.	Apr. 1-15	2-3	30	2 oz.
100	Beets, late	Detroit D. Red	April	3-4	30	2 oz.
200	Onions (seed)	Southport Globe	April 1-10	2-3	24	1 oz.
100	*Carrots	Chantenay	Mar., Apr.	2-3	30	1/2 oz.
100	Parsnips	Guernsey	Feb., Mar.	2-4	30	1/2 oz.
50	Swiss Chard	Lucullus	April	6-8	30	1 oz.
300	*Beans, snap	Strigless Greenpod	May	3	30	1 qt.
200	*Sweet corn, ea.	Gold Bantam	Apr. 10-June 1	18	36	1/2 pt.
300	Sweet corn, late	Evergreen	May 1, June 15	18	36	1/2 pt.
400	Sweet potato	Nancy Hall	May	15	36	80 plants
50	Peppers	Ruby King	May	18	36	60 plants
100	Tomato, early	Bonny Best	May	36	48	33 plants
300	Tomato, late	Stone or Marglobe	May 1, June 15	40	48	30 plants
75	Cucumber	White Spine	May	48	48	1/2 oz.
		Davis Perfect	May	36	48	1/2 oz.
25	Summer Squash	White Bush	May	36	48	1/2 oz.

*Make succession plantings.

Succession Crops to Follow the Above.

400	Turnips	Globe or Strap Leaf	After potato August	2-4	24	1/2 oz.
50	Radish	Icicle, Wh. Tip	After lettuce June-Sept.	1	24	1 oz.
50	Lettuce, leaf	Grand Rapids	After radish June-Sept.	4-6	24	1/2 oz.
100	Winter Squash	Hubbard	After peas, June	72	72	2 oz.
100	Chinese Cabbage	Pe-Tsai	After spinach, August	8	24	1/2 oz.
500	Pole beans	Ky. Wonder in corn	May-June	30-36	36	1 pt.
300	Spinach	Bloomsdale	After beans Sept.	3-4	24	1 oz.
200	Snap beans	Stringless Greenpod	After cabbage July	3	30	1 qt.

EDITORIAL PAGE

A Reconstructive Force That Should Be Unburdened

HAS AMERICAN ENTERPRISE arrived at a point at which industry, if encouraged, might gather its resources for an upward swing? And could such an upward swing be accelerated and augmented into a general industrial revival?

Signs are not wanting that industrial activity, from a state of recession, is beginning to expand. The rate of re-employment is rising. Building construction shows increased activity. Money long hoarded is seeking sound investment. Prices, notably of agricultural commodities, are rising from distress levels.

It is not improbable that if the more rapid recovery of one great basic industry were to be sensibly fostered at this time, its revival might impart stronger life to related industries and thus quicken the beat of life in all American enterprise.

LOOKING back to the depression of 1921 for possible precedent, the effect on the revival of the automotive industry of those days by the elimination of the Federal tax should provide food for thought.

It is true that America changed, in the succeeding four years, from open to closed cars, and industry, gathering momentum from the energy thus initiated, swept forward and upward to the peak of 1929. Are there factors now present which might be set in motion to create a similar revival in 1932? Let us examine the situation.

It has been carefully computed that the average life of a passenger automobile is seven years. In 1930 there were 23,042,840 passenger cars registered in the United States. Making allowance for multiple registrations and for cars scrapped and not replaced during 1931, it is safe to place 21,000,000 as the minimum number of passenger cars in operation at present.

Although one-seventh of this number must infallibly require replacement each year, about 2,000,000 passenger cars were sold in 1931. Were 3,000,000 cars to be manufactured and sold in 1932, what would be the effect upon the general health of American industry? An examination of automotive statistics provides more food—and considerable tonic—for stimulating lines of thought.

THE automotive industry uses the following products in the given percentages of their total production:

Gasoline	85.0%	Malleable iron	53.0%
Plate glass	68.7%	Nickel	30.0%
Upholstery leather.....	51.4%	Lumber	18.0%
Lead	26.0%	Copper	14.8%
Aluminum	17.4%	Cotton	9.3%
Tin	14.1%	Zinc	6.5%
Rubber	82.0%		

Could the automotive industry but produce the 3,000,000 cars needed for normal replacement, 3,197,000 workers would be employed on full time in direct production, and an additional 825,000 full time workers would be employed in the production and transportation of the materials used.

The normal living requirements of the four million families here represented could not fail to give to in-

dustry and agriculture the same up-thrust as was imparted in 1921 and the years following.

PROPERLY to gauge the force of this latent power, we must realize that automotive production has declined, roughly, one-third. Hence a restoration to normal would spell a 50 per cent increase over the present rate of employment of labor and consumption of products in that industry.

Moreover, a revival in the automotive industry would lift the strain of uncertainty from those now employed, encouraging them to make long-deferred purchases of necessities, the acquisition of which was not to be ventured with the specter of unemployment always present.

But there being no Federal tax on automobiles at present, why are not normal car replacements made? The answer is simple. In the riotous years since the depression of 1921 up to 1930, State and local license fees and other automobile taxes have been increased 455.1 per cent to an annual average of \$39.40, in addition to the often burdensome gasoline sales taxes. The average owner now pays in taxes and fees, during the seven years average life of his car, nearly one and two-fifths times the average value of his car. This, in addition to his "gas tax."

IT was hardly to be conceived that the proposal of the Secretary of the Treasury to assess a Federal excise tax on new cars, averaging \$29.11, would find patient reception anywhere.

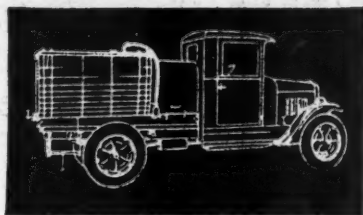
But the Secretary may have inadvertently performed a valuable service in focusing attention upon the present condition of the automotive industry. When facts are thrust before us we are likely to examine them in detail. An honest examination of this industry with an eye to its possibilities for pulling us out of our slump, discloses a powerful potential factor for business revival to be over-burdened for the task before it.

In a situation similar to the present, only a decade ago, the loosing from a small burden put this powerful agency effectively to the task of industrial revival. A like loosing of the heavier burdens of the present day would just as certainly free this willing monster to the task now at hand.

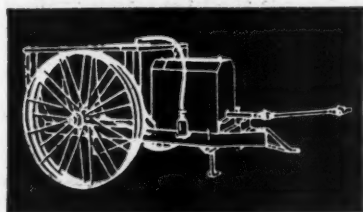
If commercial, industrial and agricultural bodies generally will but take up the fight now for a sensible reduction in the tax burdens borne by all classes of motor vehicles, the pent up pressure for car replacement will quicken and accelerate the upturn of industry and bring prosperity clear around the corner.

THE 900-million-dollar sales tax now under consideration before Congress is distinctly a step in the wrong direction. Better by far to cut government expenses—by the abolition or curtailment of many "bureau" activities—to the necessary extent, than to place this additional burden on industrial endeavor.

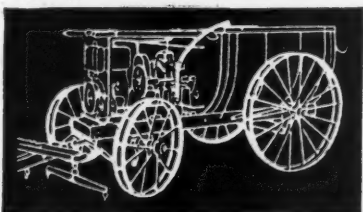
It may be advisedly stated that were nine out of ten of the Federal bureaus to close up shop—and never reopen—the effect on the general welfare would be slight but distinctly favorable. Certainly the fresh fruit industry could manage to worry along, for at least a few years, were the Federal government sharply to reduce its activities, permitting the industry to digest and to apply the mass of material which research has developed in the field of fruit production and distribution.



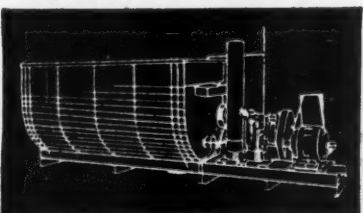
Truck-mounted sprayers, powered by truck motor.



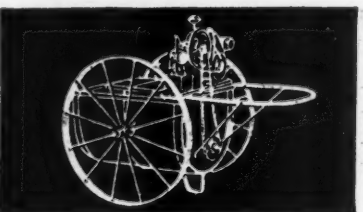
Tractor-powered and tractor-drawn outfits.



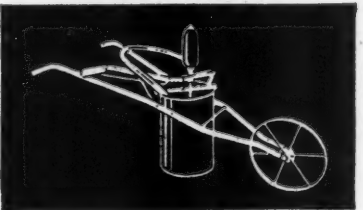
Portable sprayers in a wide variety of models and sizes.



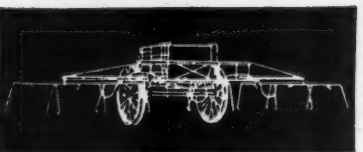
Stationary outfits in all capacities from 6 to 35 gallons operating at from 300 to 650 pounds pressure.



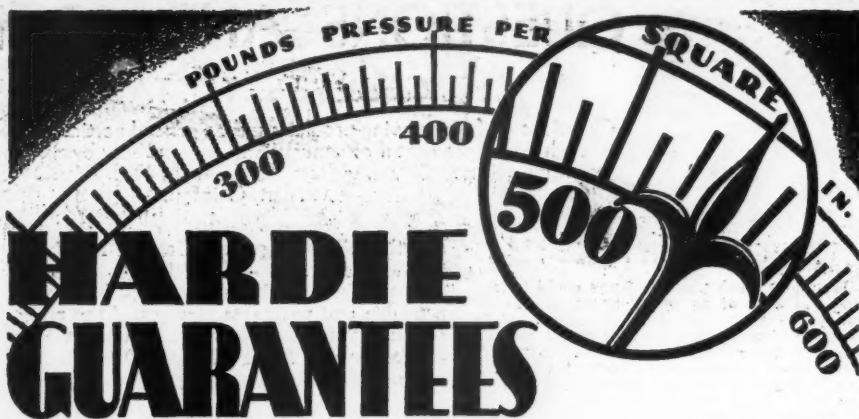
Small capacity power outfits for greenhouse and garden.



Hand sprayers in new and improved models.



Row crop sprayers powered by tractor, gas engine and traction.



HARDIE GUARANTEES

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WHEN you shop for a sprayer find out how much it is going to cost per year. When you buy a Hardie sprayer you get long life, plus unqualified assurance of real high pressure per square inch for any stated capacity in gallons per minute, and stamina in design and construction that makes for a long, long life—years not months—of dependable service.

Hardie, as always, delivers the rated gallonage at the high pressure necessary to a quick, thorough, economical coverage. The Hardie 35-gallon sprayer delivers 35 gallons per minute at 650 pounds; the Hardie 16-gallon at 500 pounds; the Hardie 12-gallon at 450 pounds; the Hardie 9-gallon at 400 pounds, and the Hardie 6-gallon at 350 pounds. Hardie doesn't make a 9-gallon sprayer out of a 6 by reducing the pressure. Hardie ratings are specific, plain, and GUARANTEED FOR LONG CONTINUOUS RUNS, not merely for exhibition purposes.

It requires big, rugged pumps of simple design, built of the finest and best materials to do a real spraying job today. Hardie designs and builds them that way. The Hardie record of performance in every commercial fruit and vegetable growing section of America is the evidence of Hardie leadership in this era of more economical, more efficient and more profitable spraying.

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Hardie portable sprayers embody the most advanced engineering. Light draft, big power plants, pumps that never fail. These outfits are built in all capacities from 6 to 35 gallons per minute operating at pressures from 300 to 650 pounds per square inch.

Hardie row sprayers, and combination row and orchard sprayers, tractor, gas engine, and traction-powered spraying up to 10 rows at once, deliver the big capacity and high pressure in the field, so necessary to big, high quality crops produced at a profit regardless of the market.

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The Hardie Estate sprayer is a power sprayer delivering real pressure and capacity, yet small enough for one person to push around and so low priced that anybody can afford it. If a small power sprayer will serve your need investigate this one.

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HARDIE DEPENDABLE SPRAYERS

QUESTIONS AND COMMENT

Conducted by T. J. TALBERT

Questions on fruit growing problems and on general horticulture will be answered through this department if of general interest. For reply by mail enclose 2c stamped envelope (air mail 5c). Address AMERICAN FRUIT GROWER, Merchandise Mart, Chicago.

Oriental Fruit Moth

Would be much pleased if you could tell me what kind of an insect is working on our peach trees in the hot weather. It punctures the terminal bud, or an inch or two from the end in the new soft growth, a tiny worm hatches, cuts through the bark and in a day or two the leaves shrivel up and die. In a few days a new growth starts and when this is a few inches long, the same thing is repeated. Abuse the trees terribly in the course of the summer. Have watched carefully but can never catch them at it.—W. D. C., Illinois.

THE DESCRIPTION which you give of the insect doing damage to your peach trees indicates a rather serious attack of the so-called oriental fruit moth.

As yet satisfactory remedies for this pest have not been developed. In fact, no definite recommendations can be made.

Some stations report fairly good results by the use of summer oil sprays or a combination of early spraying with heavy applications of hydrated lime followed by applications of a two per cent summer oil at 10-day or two-week intervals. Such applications should start about the middle of July and be continued to within about 10 days or two weeks of harvest time.

Russetting of Apples

Will you please advise me how I can reduce the amount of russetting on apples. Last year I used three pounds lead arsenate, three-fourths gallon lime-sulphur, and six pounds hydrated lime to 100 gallons of water and got plenty of russetting.—D. T. M., Illinois.

PERHAPS one of the best ways or methods of preventing russetting to fruit consists of applying the sprays during the cooler hours of the forenoon and afternoon. Many practical growers have cut down the amount of russetting or burning of foliage and fruit through such methods.

It is possible that you can reduce russetting by leaving out the lime-sulphur in some of the later sprays where fungous diseases are not serious. Where this is done, it may be advisable to add to each 100 gallons of water four to eight pounds of lime. It is also true that for the late sprays it is possible that you can also reduce russetting and burning by using Bordeaux instead of lime-sulphur for all or a part of the late applications. If Bordeaux is used, it is suggested that you employ the 2-4-100 formula.

Pear and Grape Varieties

I would like some information as to pears. I would like to know what is the best pear to can, that is, to hold its flavor and stay solid after it is canned, as well as to eat off the tree. Also, what is the earliest grape to ripen and the latest to ripen of the common blue or black varieties? What do you think of the Alfred blackberry as a home berry?—M. P. J., Ohio.

PERHAPS some of the best varieties of pears for the use which you mention and which you may be able to grow successfully in your locality are as follows: Tyson, Seckel, Anjou, Garber and Lincoln.

A good variety of early black grapes is the Eclipse, and a good late variety is the Concord. Other late varieties of different colors

are the Niagara, green; Goethe, red; and Catawba, red.

The Alfred blackberry may not be as dependable and profitable as some of the more common varieties, but you might try a few of these vines for home use. They might prove profitable in your locality.

Black Walnuts and Codling Moth

I have recently been told that the black walnut tree would harbor codling moth. Please advise me if this is true and if it is necessary to remove these trees from my orchard.—C. W. B., Ohio.

IT IS TRUE that the nuts of the black walnut may become infested by the codling moth or apple worm. The attack of this insect pest on the black walnut, however, is rarely severe. It is believed that you will not materially increase the injury from the codling moth to your apple orchard by growing black walnuts.

Should the black walnut trees become badly infested by the codling moth, it is suggested that they be sprayed with arsenicals in order to bring the pests under control. Spraying, however, is rarely necessary in the case of black walnuts.

Providing Cross Pollination

We are planning on planting this spring the following varieties: Richared, Red Rome, and Red Stayman. We would like to know if these varieties were planted together would they receive proper pollination for a good set of fruit. If not, kindly give best varieties as pollinizers.

What variety is the best pollinizer for Starr, also Northwestern Greening? Which of these five varieties do you consider best?—W. G., Delaware.

BY PLANTING Richared, Red Rome and Red Stayman in blocks no larger than three rows each across the orchard, good pollination facilities should be established. Such varieties as Richared, Starking and Jonathan should be good pollinizers for Starr and Northwestern Greening.

As to which of the five varieties, Richared, Red Rome, Red Stayman, Starr or Northwestern Greening, is the best will depend upon a number of factors. Perhaps no two growers would agree as to the best variety among this group. It is suggested, therefore, that you consider these varieties from the standpoint of your own needs as regards to the markets to which you plan to sell. It would also be well to consider the varieties from the production point of view, their resistance to disease and insects, as well as winter injury.

Apple Blotch

I am sending you with this letter some twigs from Starking trees affected as you see. Can you give me any information as to what this is and how to control and treat trees now affected? Have several trees with this trouble. All dark ones. Have several hundred Golden Delicious but none of them are so affected.—E. F., Kentucky.

THE TWIGS which you sent for our examination were so badly shriveled and dried out it has been difficult for us to determine with a great degree of accuracy as to what has caused the brown or discolored spots upon them. Indications are, however, that

this is an attack of the fungous disease known as apple blotch, although apple blotch does not as a rule affect the Starking variety seriously. If, however, you have old trees or young trees growing near the Starking variety that are badly affected with blotch, it is possible that it may have been spread to your Starking trees. The remedy for blotch is to prune out as much of the blotch canker on the twigs and branches as possible during the dormant season. This practice should be supplemented by proper and thorough spraying with Bordeaux following the calyx period. This should prevent injury to the foliage and fruit.

Shot-Hole Borer

Will you please give me some information on the following condition?

In October, 1930, I set out several acres of the sour Montmorency cherries, using trees $\frac{3}{16}$ to $\frac{1}{2}$ inch in diameter. I was told at the time that I could not grow sour cherries in this location due to some type of borer. I examined my trees some time ago and found patches of gum on some of them near the ground. I am wondering if this is the start of my trouble with borers or if it is just a natural condition. I removed the gum on several trees and cut the bark away to try to find out what was causing this gum to form but could not find any borers or anything.

Will you please tell me what causes this gum to form and whether or not it will hurt the trees? If it is a disease, do you know how to combat it?

Will you please tell me what to look for if the trees become infested with borers?—W. E. T., Ohio.

THE DESCRIPTION which you give of your cherry trees indicates an attack of the so-called shot-hole borer, a tiny beetle. This insect does injury to the trees by tunneling in the cambium or growing layer and deeper in the wood. In general, trees showing a lack of vigor due to growing in sod and without fertilization show the greatest injury.

Injury by the pest may be indicated by the wax or gum exuding from tiny shot holes in the bark; and when the bark is removed, one should observe the hole more clearly and also the tunnels of the larva or grub.

The best remedy known to prevent trees from becoming infested by this pest consists of keeping the trees vigorous and fruitful through good cultivation, fertilization, and proper pruning and spraying. Destroy all badly infested wood and trees.

Clear or Colored Grafting Wax?

How much water will an apple tree stand in the soil?

I am going to do some grafting in the spring. I want to use hot wax and put it on with a brush. Some people use charcoal ashes or lamp black in the wax. Will it do the wax good or is it harmful? The sunlight cannot get through the wax so easily. I thought the clear wax would help the bark to heal sooner.—H. R., Ohio.

IT IS difficult to say just how much water an apple tree will endure. We do know this, however, that apple trees will not do well or survive long in soils which are not at least fairly well drained.

Good results should be procured from grafting through the use of grafting wax with or without charcoal or lamp black. In fact, it is our opinion that you will notice little or no difference.

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OIL EMULSION
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CALCIUM ARSENATE
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is the GROWTH ELEMENT.
As essential to growing crops
as sunshine and rain.

INFLUENCE OF WOUNDS UPON WOOD GROWTH

By W. S. Brown

IT HAS BEEN known for some time that sap containing raw food materials travels upward through trunk and branches to the leaves where it is transformed by the action of light into carbohydrates, and thence sent downward, mostly through vessels in the bark, to portions of the tree, including the roots. The paths of this sap movement have been accurately traced by means of dyes through the different vessels of the fibro-vascular system from roots to leaves. But to account for the movement of sap, against high resistance of xylem or sapwood tissue, to the tops of our tallest trees, has been a puzzle for the botanist.

Research work recently completed by Dr. E. M. Harvey, formerly research horticulturist, Oregon Experiment Station, has thrown much light on this problem of the ascent of sap and has illuminated the factors which underlie the practices of pruning, grafting and the results of other wounds upon plant growth. Of this work I shall speak later. At this time I wish to outline a few of the common suppositions and observations we have made in our surgical treatment of trees and fruiting plants.

It has been quite generally believed that sapwood which has been functioning in carrying sap to a limb would still carry sap for the benefit of other parts of the tree after the limb which it fed had been removed.

It has been noted that the greatest growth response made by suckers, twigs and spurs after a limb has been removed is in the immediate vicinity of the cut, though some general stimulation may occur throughout the tree.

Grafts and buds usually make rapid growth, but may be checked or stunted by suckers when these are not removed.

Little has been done as yet to determine the effect of the removal of a limb or a portion of it upon the life and activities of the root or roots which have been feeding this limb and which have in turn been fed by the digested foods coming down the fibro-vascular bundles from this limb.

Harvey's Work

Doctor Harvey, to whom I have referred above, in trying to determine leaf traces and phyllotaxy in apple branches by means of dye solutions, was led into the investigation of the movement of sap in the tree. He made a new contribution to the dye method by attaching a suction force at the base of a limb or a trunk brought into the laboratory and by pulling dyes backward, from stubs of side limbs, down the main limb or trunk as the case might be. He found that the dye solution not only moved downward in the sapwood from the side branch, as was to be expected, but also that it moved upward a considerable distance in a slightly smaller amount.

In research work done during the past five or six years by MacDougal, Overton and Smith, it was found that part of the cells in each year's layer of the sapwood, carry sap and part conduct air. In some species of plants, the air is carried in wood laid down each year in early spring while in others, the air is found in the late spring and summer wood. Harvey discovered that, in the apple, air is found in the summer wood cells.

Harvey's outstanding contribution in this

field consisted in finding that the upward sap flow (hydrostatic system) as shown by dye solutions, is caused in a considerable measure by a negative tension in the air conducting cells (pneumatic system) of the sapwood. This tension is exerted through the pits of the tracheae.*

Application to Pomology

The region filled by the dye both below and above a branch indicates the amount of xylem or sapwood devoted to the needs of that branch. The cross-sectional area of the stained sapwood in the main branch just below the side branch is approximately equal to the total cross-sectional area of the side branch. The cross-sectional area of the stained sapwood in the main branch above the side branch varies greatly and may be considered to represent the ability of the side branch to remove water from the main branch above it. The amount of the cambium laid down each year is in response to the demand of the leaves and growth of the side branch. Vigorous growing side branches naturally demand greater water supply from the new cambium being laid down.

When a limb is removed in pruning, the demand of that limb on the new cambium being formed is removed, also, and consequently, new cambium is built up to serve other branches, usually in the vicinity of the limb pruned off. In other words, channels developed from cambium for the movement of sap and air are not in fixed positions, but are located wherever the need for them is strongest in its demand.

When a limb of medium size has a pruning wound below it, the pull of this limb in its effort to obtain sap is hampered by the wound; the cambium is contorted, and sometimes a swelling of the main limb appears because of the need of overlying the old unused conductive cells with new cambium. In such cases the pneumatic system may exert a tension sufficient to aid sap flow upward to the limb, but from locations not directly below the limb. This can be shown by the way the paths of the dye solution are broken up. Naturally the leaves of the limb must exert more energy to obtain the sap it needs and less energy will be left for the manufacture of reserve plant foods and fruit. The effects of cankers, gummosis spots, and wounds from cultivation implements are much like those from pruning cuts.

When a large scaffold branch has been removed, there is no evidence to show that its conductive tissues, except those of the past season, can be made available for other parts of the tree. This revelation shatters the old belief that the sap carried by a large limb is diverted to other portions of the tree when the limb is cut off. There appears to be no direct benefit in pruning off large branches except as the tree top may be opened up and more light given to other branches. Even then there may be serious danger that sunscald to the bark of a branch newly exposed to the sun may occur. In addition, the non-functioning sapwood cells give excellent opportunity for the attack of wood-rotting fungi.

It is reasonable to suppose that a root or

* Harvey, E. M. Movement of Water in Plants as Affected by a Mutual Relation Between Hydrostatic and Pneumatic Systems. Plant Physiology; 6: 495-506; 1931.

part of a root system may be injured by the removal of a large branch with which it has been directly connected by means of sapwood cells, and from which, largely through the inner bark, it has derived the digested plant food needed for its growth.

Harvey noted in young branches, from two to four years old, that a large proportion of the side limbs shared the sapwood water conducting system with each other. On one side-branch three years old, the dye solution showed unmistakably that the stub through which the dye entered, shared its water-conducting tissue with 13 of the total 28 twigs on the branch. In another case 16 out of 37 were shared.*

Naturally the effect of pruning off some of these side twigs is to increase the supply of water and food to the twigs that remain. This is in accord with our approved pruning theories to the effect that removing young branches in a tree stimulates growth of the remaining branches in the vicinity of the pruning.

Water sprouts near pruning and grafting wounds behave much like young twigs and grow as rapidly as they do because of the extra amount of cambium which becomes available to them. Water-sprouts are able to exert a greater demand upon the sap flow because the tree is usually opened up by pruning and the leaves have greater opportunity to grow to good size and use large amounts of sap in their digestive processes.

As limbs grow older, those located near the same vertical plane still continue to share in common some of the sapwood conducting tissues, but this sharing in common becomes less and less as the tree trunk or branch increases in circumference because side limbs spread apart and are no longer in the same planes.

It is well known that, mechanically, limb crotches having wide angles are stronger than those having narrow crotches, especially if the side branch is considerably smaller in size than the parent branch. Harvey's work has shown that, in most cases, though with numerous exceptions, side branches with wide angles have more sap-conducting tissue in common with the parent limbs. This would indicate a closer knit connection between parent limb and side-branch, and, hence, an additional source of strength.

In grafting or budding trees and plants, what help to sap circulation comes to scion or bud from the stock? By use of the dye solution, it has been found that the scion cannot utilize any of the old sapwood tissues for conduction of water. When the scion needs water it must obtain it from channels developed by the cambium of the stock. Healing over the end of a grafted stub is simply a covering process. There is no union between the old sapwood cells of the stock and the new wood of the scion. Unless covered within a relatively short time, the old stub may be infected with wood-rot fungi, and the life of the limb and tree be shortened accordingly. Allowing two scions to grow on stubs of over one and one-half inches in diameter until healing is completed is an excellent practice. The least desirable scion should usually be cut out when the wound has been healed.

Conclusion

From these investigations the reason why young shoots and water sprouts often grow so rapidly following pruning, becomes evident. By deduction it may be inferred, also, that the death or serious injury, which often

(To Page 25)

* Harvey, E. M. A Method for Studying Water Conduction in Plants in Relation to Pruning, Grafting, and Other Horticultural Practices. Ore. Sta. Bul. 279; 1931.

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For dormant spray "Safer than any other material known," says Dr. A. Freeman Mason. Lime Sulphur will actually benefit plant and soil. Certain other sprays may injure the tree and injure fertility of soil. Use Lime Sulphur and increase fertility of soil.

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The actual cost of spraying each tree is much less with Lime Sulphur. Growers who look to economy as well as results, take the word of many famous horticulturists who recommend Lime Sulphur as the most dependable, practical and economical insecticide and fungicide.

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Use Lime Sulphur
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Delayed Dormant
Spray—For Summer
Spray, a Fungicide in
Combination with
Poisons**

CALIFORNIA ALMERIA A QUALITY GRAPE

By H. F. Stoll

FOR SOME YEARS efforts were made in California to grow the Spanish Almeria (Ohanez) grape introduced by the United States Department of Agriculture, but because it is not sufficiently self fertile, the results were not satisfactory. Finally it was found that by interplanting the red Maraville de Malaga, a profuse pollen bearer blooming at the same time, the Almeria could be made to bear productive crops. Over half the California tonnage is produced in Tulare county where the soil and climate are particularly suited to this variety.

vigorous condition to produce paying crops.

Mr. Breiningers Almerias are packed in sawdust and shipped to the eastern markets, where they bring good prices on account of their fancy quality and careful pack. The triangular shaped clusters of this variety are very attractive. The berries are large and squarish and, when thoroughly ripe, the thick and waxy skin is golden yellow in color.

The 1931 Almeria crop was short because of drought conditions, only 121 cars being rolled to eastern markets as compared with 177 cars in 1930 and 145 cars in 1929.



A beautiful stretch of overhead trellis of Almeria (Ohanez) grapes that are now being grown on a commercial scale in California.

The beautiful row of overhead trellis Almeria grapes pictured here was snapped on the 12-acre vineyard of R. Breiningers, located two miles west of Strathmore. In pruning, Mr. Breiningers leaves plenty of wood so as to ensure ample shade. Then he thins the shoots and bunches to the number of clusters desired. In that way he gets the size crop he wants of good quality grapes. The ground is carefully plowed and clean cultivation is practised so as to keep the vines in a more

The bulk of the Almerias, in a normal year, are shipped from California during the month of October, but the movement continues through November and December. These sawdust-packed grapes are in demand for the holiday trade. They have taken the place of the once-popular cork-packed Spanish Almerias that are now banned on account of the quarantine against the Mediterranean fruit fly that infests the Land of the Dons, but which was exterminated in America.

Poor Orchard Practices Blamed for Low Quality in Fruit

ONE of the most confusing fogs that has confronted orchardists in recent years shows signs of clearing up.

The fog, in this instance, concerns the conflicting views about the effect of fertilizers on the quality of apples and other fruit. The argument started with the expansion of commercial orcharding, and it assumed large proportions as growers adopted a program of using only nitrogen fertilizers in their orchards.

Cold facts based on experimental evidence is the only lasting remedy for clearing up any fog which is the outgrowth of a popular fallacy. An abundance of facts is at hand to puncture the theory about the injurious effects of fertilizers upon fruit. Two experiments, both recently reported, are of particular importance, as the results clearly contradict the claims that have been made in some sections of the country. These tests, one conducted in Maryland and the other in

Ohio, show definitely that the keeping and shipping quality of fruit is not affected by the use of certain fertilizers.

Fruit Tested Under Pressure

The Maryland tests, covering two years' work, were designed to study the firmness and keeping quality of fruits as affected by nitrogen fertilizers. Various fertilizers were applied as well as a complete mixture. Samples of fruit, selected from the plots, were tested with a pressure plunger at picking time and at intervals during the storage period.

The tests were made with apples and peaches. The plots were located in commercial fruit sections of the State on several different types of soil. The rate of the fertilizer application varied with the age and the condition of the tree, some which plainly showed the need of nitrogen getting as much as 20 pounds of nitrate of soda.

As summarized by E. S. Degman, research assistant in horticulture, University of Maryland, applications of nitrogen did not reduce the keeping quality of the fruit. Neither the firmness at picking time nor the rate of softening during storage were affected to any noticeable degree. In some orchards fruit from nitrated plots actually tested higher and kept better in storage than fruit from check plots.

Poor Practices Blamed

Poor keeping quality, says the report, can generally be traced to certain orchard practices. If unwisely administered such practices as pruning, thinning, irrigation, and soil management may result in the production of immature and poor-quality fruit which is sometimes incorrectly ascribed to the use of nitrogen fertilizers.

For three seasons J. H. Gourley, horticulturist of the Ohio Experiment Station, has been studying the same question, but he has approached it from the standpoint of the chemical changes produced in fruit by fertilizers. He has given particular attention to "breakdown" of apples, which is often attributed to nitrogenous fertilizers. This condition is characterized by an early mellowing and mealiness of the fruit, followed by darkening of the interior. In other cases the region just beneath the section shows pronounced softening.

No Evidence of Breakdown

The results fail to indicate that internal breakdown is in any way affected by the use of nitrogen. Even fruit from trees which have been receiving two to nearly five times the usual amount of nitrate have not been affected by the treatment. In a Stayman Winesap plot, for instance, one section of trees received "normal" amounts of nitrate of soda; a second got three times the normal application of nitrate; a third, a complete fertilizer; and a fourth received no fertilizer treatment. It is significant that none of the fruit from the four plots showed any decay as late as April.

These two experiments are particularly valuable because they help to correct a false impression which could very easily prove costly to orchardists. As the tests show, poor quality of fruit is generally the result of poor orchard practices. In the last analysis, quality of fruit will be improved only as more attention is given to sound practices of orchard management.—W. W. Weir.

Honeybees are so helpful in cross pollinating fruit trees that in many sections they are kept for this purpose rather than for the production of honey.

Read this Letter — It Means Thousands of Dollars Saving to Fruit Growers

OFFICE CORRESPONDENCE

From F. O. Moberg
To Sales Dept.

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Frank Moberg
President and General Manager



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ELECTRICITY FOR FRUIT GROWERS

By Kenneth Stalcup

THE USE of electricity on farms has gone far beyond the experimental stage and is rapidly asserting itself as a necessity. There are more than 200 uses for electricity on the farm, and the majority of these have proved practical from the standpoint of their economy

inadequate supply of water may mean severe losses from fruit pests. The electric motor is the most reliable power unit to insure sufficient water. Where water is pumped into a pressure tank, electric power is practically always the most satisfactory, since the motor



Yates packing house, Knox county, Indiana, is equipped with electric washer, grader, elevator and lights.

or their convenience. Rural electric lines which serve farm customers are usually operated at 2,200 to 6,600 volts. The line voltage is reduced for farm service to 100 volts for light, heat and small motor uses and to 220 for use for large motors. In addition to the vast numbers of farmers already enjoying the use of electricity, there are others who generate electric current with individual plants for lighting and small motor operation.

There is probably no other type of farmer who has more uses for electricity than the orchardist. Electrically operated equipment should not be employed in the orchard unless enough profit can be derived from its use to justify installation. A few of the more important uses for electricity will be briefly discussed in this article.

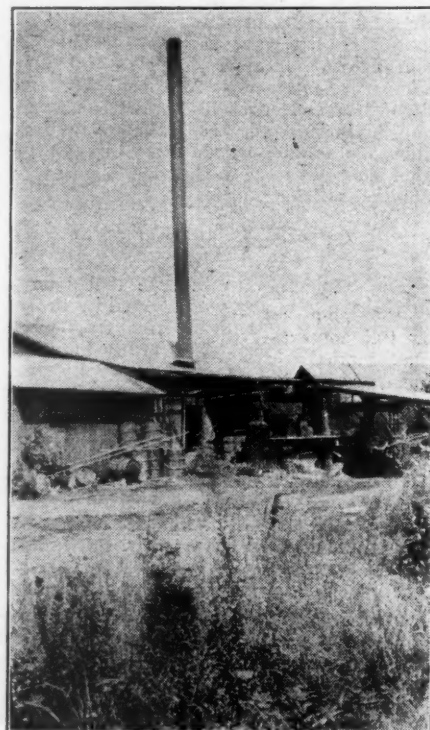
A large number of orchardists are now building huge storage houses in order to hold their fruit against better prices. The installation of electric ventilating fans in these storages increase the circulation of the air which in turn keeps the fruit in better condition. The fan should be so arranged that it will not obstruct the natural air circulation through the ventilators. In other words, it should be possible to operate the ventilating system without running the fan during cooler weather when electricity may be saved by resorting to natural ventilation. An airplane type of fan using two blades is very satisfactory for cold storage use, as the flue is not greatly obstructed by the blades of the fan.

The electric motor is also employed in the mechanical refrigeration machine in storage houses. It is possible to regulate the temperature exactly with these refrigeration plants so that there is no danger of the fruit becoming too warm or too cold. An item which is of great importance to the orchardist is the comparative freedom from mechanical troubles and the possibility of eliminating an attendant, usually required for operating other power units.

During the spraying season, it is necessary that there is an abundance of water. An

may be automatically controlled by a pressure switch.

For the past several years a number of stationary spray plants have been installed



The power house on the Troth orchards, Orange county, Indiana.

in orchards in this section. The plant in the Coffing brothers' orchard, Fountain county, Indiana, is one of the most efficient. Two 26-gallon pumps, carrying about 450 to 500 pounds pressure, and two 600-gallon tanks

comprise the stationary equipment. Pipe lines have been laid on top of the ground between every sixth row of trees throughout 100 acres of the orchard. At regular intervals there are connections in the line and it is possible for two men with a hose to reach 25 trees from one connection. It is estimated by the Coffings that this stationary spray plant has saved them one-third to one-half of the labor expenses of spraying.

The fruit washer is another piece of equipment which employs the electric motor whenever electricity is available. A fruit washer is one of the greatest labor saving devices on the market. In 1930 Reed and Simpson, both of Knox county, Indiana, installed washers operated by 10-horse power motors.

Lifting or lowering fruit from the floor of the packing shed requires a large amount of labor, unless steps are taken to install elevators. A large number of baskets of fruit may be handled easily in a short time if elevators are employed. A three-horse power motor provides sufficient power to operate one of these elevators.

Last but by no means least comes the use of electricity for lighting purposes. Electric lights make it possible to work late at night in the packing shed at the height of the season when all the fruit seems to be ripening at the same time. Lights come in handy in the storage houses to inspect the fruit and to see that everything is in order. Lights also play an important part in operating roadside stands at night.

All of the above mentioned uses for electric lights have given good results in actual practice. The successful orchardist of today finds it impossible to grow fruit on a large scale or to compete with his neighbor unless he installs the proper equipment to take care of a heavy output. Many other experiments involving the use of electricity are being conducted at our State universities, and the day is not far distant when every farmer will be forced to make use of the greatest of all energies—electricity.

Leaf Hoppers in the Ozarks

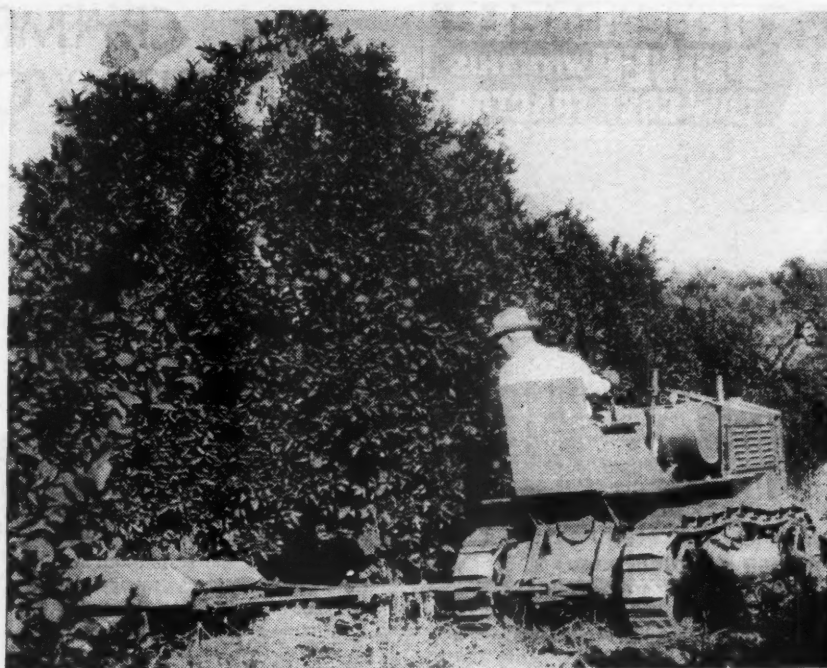
APPLE TREES in the Ozarks are subject to attack by five leaf hoppers—the oblique-striped, the red-spotted, the green, and the white apple leaf hoppers and the potato leaf hopper. These insects suck the plant juices from the leaves.

A study of the five leaf hoppers at the Bentonville, Ark., laboratory of the Federal Bureau of Entomology, showed that only two—the oblique-striped and the red-spotted apple leaf hoppers—are especially important in that district.

These two species, the study showed, have almost identical habits, seasonal histories, and life histories. Each has two complete generations and a partial third generation annually. They live through the winter as adults and emerge from hibernation in early spring when the leaves begin to expand.

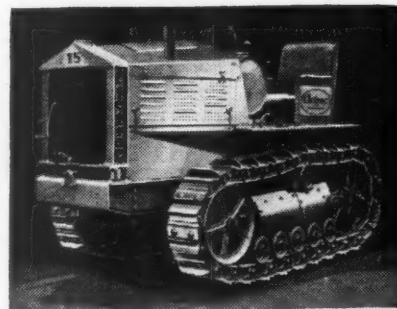
Spraying is recommended as the best control measure against leaf hoppers attacking apple trees in the Ozarks. Good commercial control was obtained by applications of nicotine sulphate in concentrations as low as 1-1, 600 combined with a 3-4-50 Bordeaux. The addition of laundry soap in the proportion of one-half pound to 50 gallons, or of resin fish-oil soap one pound in 50 gallons, made the treatment slightly more effective.

Technical Bulletin 263-T, "The Leaf Hoppers Attacking Apple in the Ozarks," recently issued by the United States Department of Agriculture, reports the characteristics of the apple leaf hoppers common in the Ozarks and tells how to control them. Copies may be obtained from the Office of Information, United States Department of Agriculture, Washington, D. C.

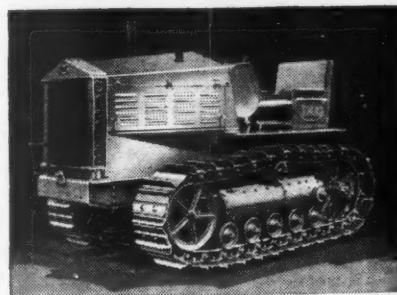


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CRAMPING THE FRUIT WORM'S STYLE

(From Page Five).

but 12 per cent of the overwintering larvæ. The varieties of peaches grown have an influence on the number of larvæ carried over winter from the previous year. It is a well known fact that varieties that ripen later than Elberta are more severely injured than earlier varieties. It is also true that such varieties carry more larvæ over winter than earlier varieties. Consequently, in setting out young orchards, the planting of varieties that ripen later than Elberta is not advisable; and old trees that are of little economic value can profitably be removed.

Thorough and timely cultivation of the orchard during the spring and summer months seems to aid somewhat in reducing the fruit moth infestation. An effort was made during the season of 1931 to determine the location of the summer cocoons. The results of this work indicate that under average Ohio conditions in cultivated orchards approximately 30 per cent of the summer cocoons are located on the ground.

The proximity of an orchard to storage sheds and packing houses sometimes has an influence on the degree of injury sustained in both twigs and fruit. If large quantities of late varieties of peaches are permitted to stand on the premises for several days, many larvæ will crawl from the fruit and spin cocoons in the first suitable place that is found. Studies of used baskets from various sheds made during the past two seasons yielded averages of from one to seven hibernating larvæ per basket.

Variations in infestations appear that as yet cannot be definitely accounted for. One section of an orchard is often more heavily infested than the remainder and this section usually remains more heavily infested throughout the season. In one orchard in northern Ohio the south side has been most heavily infested throughout two successive seasons.

Control

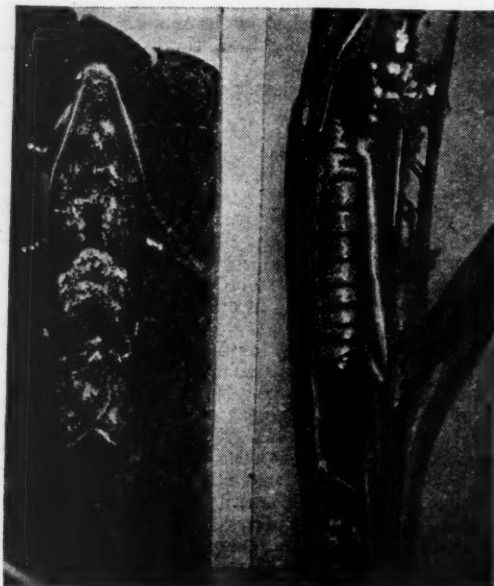
An experiment on quinces in an orchard in northern Ohio during the season of 1931 yielded the most promising results yet obtained. A block of approximately 60 trees was divided in the center, one side being given an experimental oil treatment and the other side sprayed on the same dates with hydrated lime.

The experimental spraying schedule consisted of five applications of a summer oil at a two per cent strength. Sprays were applied at intervals of about 15 days, the first spray being applied on July 6. The first three sprays also included arsenate of lead at the rate of one pound to 50 gallons of water.

An examination of the fruits at picking time showed that 97 per cent of the lime sprayed quinces and 40 per cent of the oil sprayed quinces were injured by the oriental fruit moth. A more careful examination of a few hundred quinces from each block showed an average of 479 worm holes in 100 quinces from the lime sprayed block as compared with but 18 holes in 100 quinces from the oil sprayed block. Although the infestation had been reduced 57 per cent by the oil spraying program, the comparison of the worm holes in quinces from the two blocks indicated that 96 per cent of the larvæ had

been killed. This, however, still does not tell the whole story, for the lime sprayed quinces were practically unsalable, whereas the greater portion of the oil sprayed quinces sold on a ready market.

Extensive experiments with summer oils on peaches have been conducted during the past two seasons. Although the results of these experiments have not been wholly satisfactory, they have nevertheless shown consistent reductions in fruit moth injury. These



Left.—Adult oriental fruit moth. Right.—Section of peach twig showing larva within. (Both greatly enlarged.)

experiments might be summarized by saying that our best spraying schedule consists of four or five applications of a summer oil at a two per cent strength covering a period of six weeks just prior to the first picking. Applications should be made at intervals of from seven to 10 days, the last application being made within 10 days of the first picking of peaches. This material when properly applied can be relied upon to reduce the infestation in Elberta peaches by as much as 50 per cent and on some occasions by as much as 80 per cent.

The oil sprays should follow the regular "shuck-fall" and "two-weeks" sprays for peaches but it will be necessary to omit the pre-harvest application of sulphur, otherwise burning is almost certain to occur. It is necessary to spray thoroughly in order to cover the leaves on the under surface where the fruit moth eggs are usually deposited.

At the price paid for labor and materials in northern Ohio, and at the rate of four gallons per tree for each application, such a schedule would cost approximately 32 cents per tree. The advisability of following such an extensive spraying program would necessarily be governed by the value of the anticipated crop.

A new and complete bulletin about citrus diseases was recently published by the Florida Experiment Station, Gainesville. It is number 229, and free copies are available.

All of the diseases that are likely to be found in Florida citrus groves are discussed in this 216-page bulletin.

UP FROM SIX ACRES

(From Page Seven)

tried biennial sweet clover, as well as red clover, and those two also have their failings. But foxtail comes up quickly in the summer after the cultivation has ceased, and when we get ready to cultivate again the next spring we find plenty of roughage to cut up and to mix into the soil."

To get the best possible pollination, Mr. Carter and Edwin rent bees, paying \$2 per hive for 100 hives. Anyway, this was the plan last spring. The bees were brought from a 400-stand apiary 20 miles or more away, just before the trees blossomed, and were taken home again just before the calyx spray was put on. The apiarist did the hauling both ways, and besides receiving the \$200 for the total rental, he felt satisfied that the bees had benefited from the harvest of nectar and pollen.

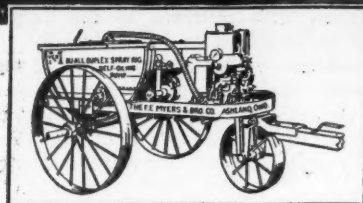
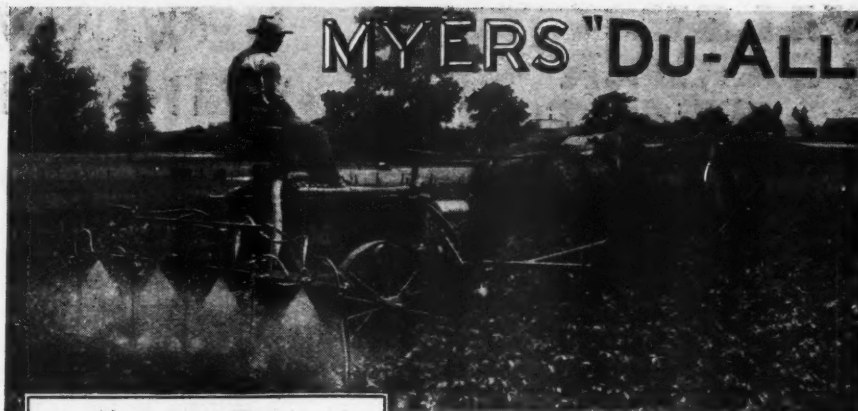
Mr. Carter pointed out his idea of alternating tree rows between two varieties. "Mixing the varieties makes possible more efficient pollination," he explained, "and while we have mixed up only the rows, they are now recommending that varieties be mixed within the rows. New plantings would be arranged that way were it not for the fact that it would be harder to harvest the fruit," he added.

In a block of Jonathans and Delicious the two varieties alternate row after row, and so do Black Ben Davis and Winesap in another block. In every sixth row middle, both ways of the orchard, the Carters have a fire guard. This is merely a plowed strip a few furrows wide. Then if the dry cover crop should be accidentally set on fire, the fire would be confined to a comparatively small area.

Occasionally there comes a spring when the fruit is in danger from frost. Here is a problem that Mr. Carter believes is practically solved, since Edwin conceived the idea of making oil smudge pots from old oil barrels. The barrels are cut in two. Then each end, setting on its "head," has the cut-off end slitted all around so that the metal can be pressed toward the middle to form a rather small opening. Into the container thus formed, crude oil is poured, or old crank case oil when that can be procured. An old gunny sack is then put in for a wick. Lighted, one of these improvised smudge pots will burn two hours, at least. At the time of our visit, the smudge pots were being used only on an experimental basis, while a big pile of steel barrels were on hand to be worked over for the need.

And lest a problem of marketing should present itself in the form of low prices, the Carters are planning accordingly. The answer will be an apple cave kept low in temperature with an ice machine. Under a one-way roof on a ground level floor the apple wagons will be driven in. The loads will be sent into the basement by a conveyor. Then in case any of this fruit should need to be held for sale in the spring or summer following, the refrigeration plant will make that possible. In fact, it will provide cold storage like that to be found only in regular cold storage plants of the cities.

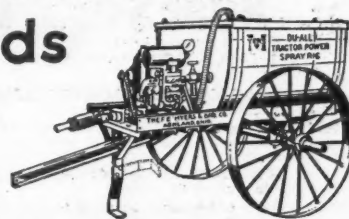
"That, we think, will be the solution of the cold storage problem," said Mr. Carter. "But," he added, "new problems are presenting themselves all the time, especially in the orcharding game. So we must watch for them and in the meantime keep contact with specialists and practical orchardists everywhere, for surely we have something to learn one from another."



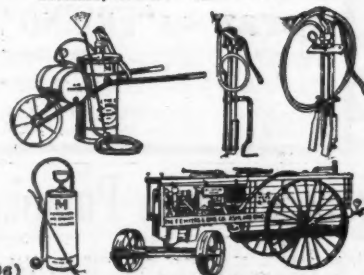
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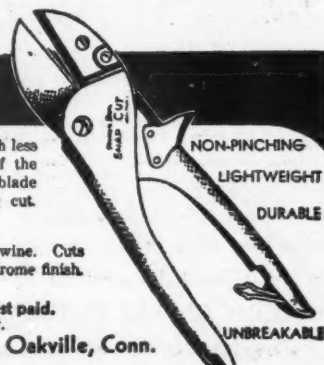
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NEW INVENTIONS IN OUR FIELD

By James Atkins

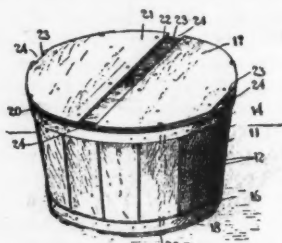
WE HAVE arranged with James Atkins, registered patent attorney, Munsey Building, Washington, D. C., to furnish our readers through this department with memoranda of the recently issued patents relating to the improvement of equipment in the fruit field and in associated industries.

Inquiries with reference to this subject should be addressed to Mr. Atkins, at the above address, where they will receive prompt attention. Mr. Atkins is also well qualified to advise, in confidence, on any matters relating to the patent ability of inventions and the registration of trade-marks and copyrights.

Fruit Basket

Eight claims are made and allowed in a patent (Serial No. 481,057) granted to Raymond H. Brainard, New York, on a tub-style basket, in the fourth claim of which it is described as:

"In a basket, a body member having substantially closed side walls and having a reinforcing hoop at the upper end of the side walls, portions of the side walls being ex-

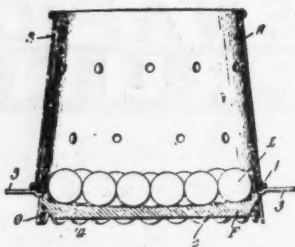


tended above the reinforcing hoop, said extended portions being spaced about the periphery of the hoop, and a substantially flat cover member overlying and abutting the extended portions, whereby openings are provided between the hoop and cover member for viewing the contents of the basket, and whereby forces applied to the cover member may be distributed directly to the side walls through the extended portions thereof."

Basket Packer

James W. Trew of Maryland makes 11 claims for his apparatus for packing fruit, the first of which describes it as:

"A fruit facing apparatus comprising two relatively movable members to receive there-

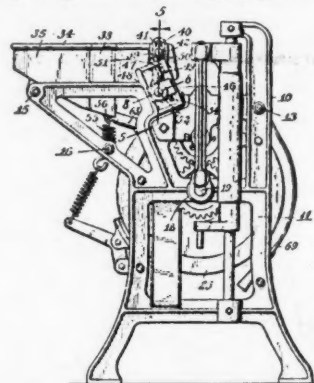


between an end portion of a package liner, said members upon relative movement in one direction bending inwardly the portion of the liner between the members."

Cherry Pitter

A former patent (Serial No. 27,782) obtained by Charles T. Howson of New York on a machine for pitting cherries is incorporated in a new patent (Serial No. 326,877) granted to the same party. In the first of nine claims the device is described as:

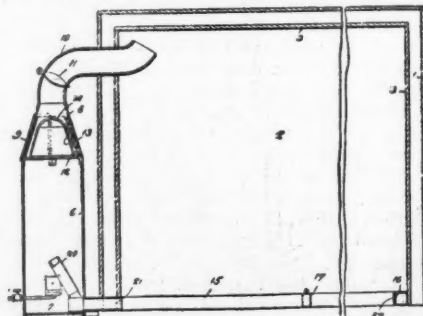
"A pitting machine, comprising a frame, an



element movable within said frame having pitting openings therein, a feed hopper for feeding cherries to said pitting openings, a rotatable brush at the feeding end of said hopper spaced from the bottom of said hopper to allow the passage thereunder of a single layer of cherries at a time, said brush serving to retard the feeding movement of the cherries, and a fixed element in said hopper adjacent said brush spaced from the bottom of said hopper a distance to allow a single layer of cherries only to pass underneath said fixed element at a time preparatory to moving to said brush."

Fruit Ripening Apparatus

A patent (Serial No. 385,674) has been granted to James O. Walsh of New York on an apparatus for ripening fruit, in which the



description contained in its single claim reads as follows:

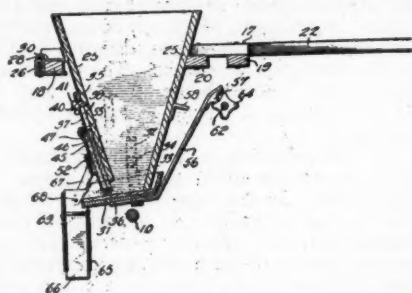
"The combination with a fruit ripening room, of a drum located outside of the room, a burner in the lower portion thereof, a water container removably mounted in the upper portion thereof, a flue for conducting heated air from the upper portion of the drum to the upper portion of the room adjacent one end of the room, a damper in said flue, a flue having inlets for receiving air from one side and end of the room adjacent the bottom thereof and conducting it to the

lower portion of the drum, dampers for said inlets, and a pipe within the drum extending from one end of the flue and inclined upwardly over the burner, said pipe being open at its ends, said room, drum and flues co-operating to form a sealed system for the repeated circulation of the same air or gas throughout the ripening operation."

Fertilizer Distributor

Thomas H. Debnam and Edwin C. Ferguson of Virginia are allowed a patent (Serial No. 414,770) on an agricultural implement which is described in the first of the two claims as follows:

"In an agricultural implement, a frame, a hopper carried by said frame and having a projection thereon, a pivoted shoe arranged adjacent the bottom of said hopper, said

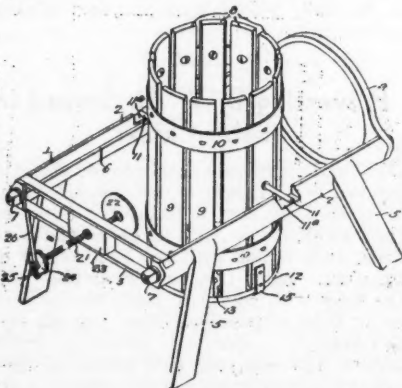


hopper being provided with an opening whereby material may flow therefrom into said shoe, an adjustable gate to control the amount of material flowing from said shoe, a second gate movable downwardly to prevent the flow of material from said shoe, said second gate tilting said shoe about its pivot point when the former is in its downward position, and spring means engageable with the projection of said hopper for resiliently opposing pivotal movement of said shoe."

Fruit Press

In the single claim made for a new fruit press invented by Albert Ipri of Pennsylvania, the device is described as follows in the patent allowed (Serial No. 498,144):

"A fruit press comprising a frame, supports for the frame an annular ring vertically disposed at one end of said frame, a barrel pivotally and slidably mounted on the frame, and adapted to be filled with fruit and ar-



anged to abut said annular ring when in a horizontal position, the said barrel being composed of longitudinal staves spaced apart to allow the juice of the fruit to flow from the barrel, end disks in conjunction with the barrel adapted to maintain the fruit entirely within the barrel, and pressure means cooperating with the annular ring for extracting the juice from the fruit."

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PRACTICAL POULTRY POINTERS

QUICK growth, low mortality and normal development are the results expected of the chick ration. Broilers must reach two pounds at eight to 10 weeks. The ration must be free of mold and harmful materials that cause heavy losses. It must be complete, giving normal growth of bone, feather and flesh.

The term "balanced" ration is hardly adequate. The science of poultry feeding is so new that many things remain to be learned. The proper balance between the many ingredients has not been worked out. The term "complete" more accurately describes it and is the one we prefer to use. We know the materials that should be there but not the quantity of each.

To illustrate, we know that several chemical compounds, known to the chemist as vitamins, proteins, minerals, etc., are necessary in the diet. The quantity of each of these compounds or the balance between them, is not known. The relation between the various kinds of minerals further illustrates this point. A rather delicate relationship exists between the bone meal and calcium of the ration. They must be present in a certain ratio or abnormal bone growth is likely to result.

The mineral portion of the ration is probably the most complicated and most difficult to balance. Changes in the manufacturing process of meat and bone scraps has added to the difficulty. This product is well standardized for protein, but the mineral or ash content is variable. It may range from 12 to 30 per cent or even more.

Increasing demand for meat scraps has led manufacturers to increase the bone material. This has added considerably to their output. Individual samples have been found to carry over 30 per cent ash, the most of which is bone meal. This increase in bone has played havoc with certain formulas that were worked out on high meat scrap content but low bone content. Tests have shown that meat scraps with low ash content are more desirable in the chick ration than brands high in bone meal.

The addition of minerals to the ration now becomes a very delicate problem. It may be exceedingly harmful and conducive to abnormal bone growth to add them. Tests at the Kansas State College have shown that additional bone meal is harmful in a chick ration containing as much as 10 per cent meat scraps.

The term protein is not well understood. Protein is made up of parts the chemist calls amino acids. There are many of these amino acids. Certain ones are present in protein from meat scraps, others in soybean meal, others in corn, wheat, and milk products. The protein of meat scraps and milk seems well suited for the growth of chicks and is used almost exclusively. Of course, the protein of grains is added in small quantities when corn, oats and other grains are added to the ration. Perhaps some day as we continue to study feeding problems we will be able to compound a better-balanced protein by using a greater combination, and greatly reducing the quantity of it required. Kind of protein, now, seems more important than quantity.

As to vitamins, two are known to be essential in the chick ration. Starting down the list these are vitamins A and D. Vitamin A is added through yellow corn, alfalfa and green feed. It is for this reason that yellow corn is always preferred to white. The more concentrated forms of alfalfa, such as leaf-

meal, are preferred, as chicks are not able to handle large quantities of fiber. In yellow-shanked breeds, a deep yellow or orange color is an indication of adequate vitamin A. The pale shank is likely to be accompanied by a rousy condition with spots on the throat. It is known technically as avitaminosis A, or lack of vitamin A.

Sunshine, or cod liver oil, supplies vitamin D to the chick. Without it rickets develop. Cod liver oils are said to vary considerably in their vitamin content. The only way to know that they contain the vitamin is to test them in the laboratory by feeding to chicks. Reliable companies are now having this test made. Sunshine is, of course, of no value to the chicks unless it shines directly on the bird's comb, feet or shanks. The open window of the brooder house on warm days to admit sunshine is an aid in raising healthy chicks.

In compounding a ration, consideration must always be given the grains grown in the section. In the corn belt it is of advantage to use a considerable quantity of corn, wheat and oats. Having observed the use of the Kansas all-mash ration experimentally and on hundreds of farms, we are in a position to recommend it to those wanting a formula of this nature.

The Kansas All-Mash Chick Ration

	Starting Mash	Growing Mash
	lbs.	lbs.
Ground Yellow Corn....	48	54
Bran	15	15
Ground Oatmeal or Groats	15	..
Ground Oats	15
Meat Scraps	10	10
Dried Buttermilk	5	5
Alfalfa Leaf Meal.....	5	..
Cod Liver Oil.....	1	..
Salt	1	1

There is little to say about the routine of feeding an all-mash ration. As soon as the chicks are taken from the incubator they are put on self-feed of the mash. They have water to drink and access to chick-size oyster shell. When six weeks old the ration is changed to a growing mash and scratch grain is added. Until ready for the laying mash in the fall, pullets have self-feed of both growing mash and grain.

Preventing B. W. D. Spread in Baby Chicks

SHOULD it happen that infected chicks are hatched in an incubator, the machine should be cleaned by first brushing the down out, then scrubbing it with a cloth and water made quite strong with any good dip or disinfectant. After this has dried, plug all of the holes with cotton to make the incubator as air-tight as possible. Now you are ready to fumigate. For an incubator holding around 150 eggs, use two ounces of needle crystals of permanganate of potash in a shallow dish, and pour two ounces of formalin over these crystals. Push this back into the incubator and shut the doors quickly. Leave it this way for at least 12 hours.

CAUTION: Do not allow the room temperature to fall below 65 degrees Fahrenheit, as this will cause the formaldehyde gas that you are making to condense to where it will have no value as a fumigant.

Right up to date

XUM

THE CODLING MOTH IN WASHINGTON

(From Page Six)

general trend toward their use began about 1923 and at the present approximately three-fourths of the orchardists are using them. Additional orchards are being equipped as fast as tree growth compels and profits justify. The use of electric power in the district spread with the stationary spray plant.

Most of the orchards equipped with stationary plants are pumping spray from 500 to 1,200 gallon tanks through galvanized pipes to every corner of the orchard, even on tracts of 400 or 500 acres. These sprayers furnish pressure up to 450 or even 550 pounds at the spray gun nozzle. The orchardist sprays out a block of trees from one spigot and then transfers to another block, with faster coverage of the orchard and higher efficiency of spray.

Even with these improvements in methods and machinery there has been a gradual increase in codling moth infestation. A constant tendency, especially in warm seasons, to apply more and heavier applications shows that the fight has constantly become more difficult and more expensive. Anthony Spuler, investigator in codling moth control of the State College of Washington, has pointed out that our large trees need as much as 30 gallons of spray material to cover them adequately and efficiently. The difference between irrigated sections and that of other sections may be illustrated by the experience of two boys from the Middle West, whose father owns a 40-acre orchard. After helping us spray a 10-acre orchard last year, they stated that we used as much spray on the 10 acres as they used on 40 acres in the Middle West.

Next in importance to thoroughness of coverage is the proper timing of sprays. There was a time when the spray dates were set somewhat arbitrarily, with some attempt to gauge the number of overwintering larvae which emerged as moths. Later we set spray dates by the emergence of codling moths in cages. E. J. Newcomer, Federal investigator in codling moth work at Yakima, called attention to the relation between evening temperatures and egg laying. As a result of studies on this point we found that whenever the temperature at 8:00 p. m. rose to or above 60 degrees Fahrenheit, egg laying was taking place and we had to have the spray on within 10 days. That was the most accurate method that we had up to recently.

Moth Traps Set Spray Dates

In 1926 Anthony Spuler began to experiment with moth traps filled with fermented apple juice. Later he tried other materials, including malt sirup yeast combination which he found very effective. Records of the number of moths caught at different heights showed that most moths were caught in the upper one-third of the tree. He also found that the moth activity indicated the rate of egg laying. A year later Spuler announced that by the use of moth traps we could accurately set our spray dates for various cover sprays. He found that the cover spray must be applied within 10 to 12 days after the codling moths begin to enter the traps in numbers in the spring. The accompanying chart illustrates this method. By checking moth activity and the evening temperatures it has been possible to gauge the hatching of successive peaks almost as well as the train dispatcher gauges the arrival of trains. Orchardists who now follow this system are able to cover their fruit just prior to each succeeding large hatch.

Spuler also discovered that there is a daily loss in deposit of arsenate of lead per square inch amounting to 3.6 per cent decrease in the early part of the season and 0.9 per cent per day in August and September, accounted for largely through the growth of the apple. It became obvious that it was necessary to have the maximum coverage before each successive big hatch.

The district horticultural office established bulletin boards at a number of stations throughout the district. Here a record is kept of the catch in 10 traps and orchardists are enabled to watch the moth emergence from day to day. Practically all the apple districts of the Northwest are now using this system. Many orchardists also check up the moth catch in their own orchards.

Prior to the use of the moth traps there was generally thought to be a difference of several days in the peaks of emergence in varying locations of altitude and exposure. But a comparison of moth trap records indicated that the high peak of moth activity corresponds very closely throughout the irrigated fruit area from the Canadian boundary to southern Idaho.

A picture of the 1931 moth emergence explains why it was an unusually difficult year to control codling moth. Most of the overwintering moths of the first brood came out in May. Due to the unusual and continual high temperatures during the last half of May there was a constant emergence of moths. During the last half of the month the temperature averaged perhaps 10 degrees higher than normal. It has been found that the first high peak of moth emergence occurs every year during the second or third week in May. There are usually four or five successive lesser peaks of the first brood extending up to about July 4. It is quite evident that approximately 90 per cent of the moths of the first brood emerged by June first of last year, an unusually high percentage. Any slipping on spray dates or lack of coverage during this hot spell in May tended to let enough by to make a big second brood.

The time of moth emergence in different orchards corresponds very closely throughout the arid districts. The amount of emergence in the first brood as indicated by the moth traps is directly proportional to the number of overwintering larvae. Emergence for the same orchard over different years would indicate there were not as many overwintering moths the past season in this district as in others. But the favorable temperatures let more larvae through the first brood sprays. The second brood of codling moth increased in number very rapidly the middle of July. The second brood catch of codling moth averaged much higher in 1931 in most orchards than in any previous season. Also it came earlier, complicating the spray operations for the second brood. Mr. Spuler has pointed out, however, that the number of moths caught in the second brood compared to the first does not necessarily indicate the true proportions of the size of the broods. Ordinarily the high peak of the second brood comes during the last 10 days of July. In 1931 the high peak started 10 days earlier and reached the highest point about July 20, the whole second brood being moved ahead about one week. There was a constant emergence of moths from early in July until almost picking time and the rise during the latter part of August indicated at least a partial third brood, something that does not happen every season.

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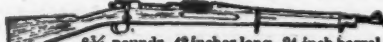
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AROUND THE GARDEN

THE HIGHEST degree of production and profit will not be attained in gardening unless considerable attention is paid to the condition of the garden soil.

Inasmuch as there will be little or no vegetation to plow under and thus maintain the humus content of the soil, this will of necessity have to be supplied. Stable manure, on account of its high proportion of partially decayed fiber, is ideal for the purpose of supplying the soil with the necessary fibrous material or humus.

The fertilizing elements contained in stable manure do not differ materially from the same elements contained in commercial fertilizers, popular opinion to the contrary notwithstanding. After the soil moisture and air and heat and bacteria have performed their work on the stable manure in the soil, the fertilizing elements or plant food finally selected by the feeder roots of the growing crops will be the same "salts" of nitrogen, potash and phosphorus that are commonly purchased in sacks of 100 pounds.

It is possible, therefore, to supplement the supply of stable manure with commercial fertilizers and still maintain the highest possible point of production. While as much as 20 to even 30 and 40 tons of manure were formerly thought necessary for an acre of garden area, experience has shown that 10 to 12 tons of stable manure will usually supply the necessary amount of humus, and permit the remaining requirements for plant food to be supplied out of the fertilizer sack.

In general it may be said that a complete fertilizer containing two to four per cent of nitrogen, eight per cent of phosphorus and four per cent of potash will be about right for garden soils. If "high analysis" fertilizers are used they should be composed of multiples of the above figures. From 800 to 1000 pounds of "4-8-4" to the acre will usually serve to supplement 10 tons of manure. If a fertilizer with a formula as high as 10-20-10 is used, the amount should be correspondingly cut down to 320 to 400 pounds per acre.

Early Plowing

Fall plowing is generally considered best for the garden. If that important operation is performed, then many good results are to be secured. Burrowing insects or their pupae are exposed to the weather and destroyed, the humus in the stable manure progresses further toward decay, the soil retains more of the winter precipitation and can usually be worked earlier in the spring.

But if this operation is left until spring, it should be done as early as possible in order that the soil may be in shape to receive and store the spring rainfall.

Most garden soils are not plowed to a sufficient depth. While the depth should seldom be less than 10 inches, more often than not it will be found to be six inches, and seldom over seven. Such a condition may require a period of years for correction. The plow may be set to turn up an inch of subsoil this year, and commercial fertilizer may be harrowed into this layer of soil after the plowing is completed. Next time the plow may be set an inch deeper, and so on each year until from 10 inches to a foot of soil is turned over every season.

Harrowing should follow the plowing and be deep and thorough. Much of the success of the garden will be determined by the care given to the preparation of the soil at this time.

The Garden Tractor

For economy of time and labor in cultivation, the rows of vegetables will extend the length of the garden area, if one dimension is greater than the other. The rows also should be spaced so as to permit cultivation by horse or garden tractor.

This type of tractor is growing in favor, especially on fruit farms where more and more of the routine work is accomplished by tractor power. Indeed, on not a few fruit farms the horse has passed entirely out of the picture and gasoline power is used in all operations.

A garden tractor pays for itself in but a few seasons, as the rows of vegetables may be planted to the closest distance practical, even as close as 12 to 18 inches, with a consequent increase of production per acre. The garden tractor is especially valuable in the case that it is proposed to market the surplus of garden crops, or where such crops are grown to supply the roadside stand.

Most garden tractors can be equipped with multiple row planters and cultivating accessories. Two or more rows may be planted simultaneously, and as many as three or more may be cultivated. Thus the man labor is spread over two or three times as much lineal length of row as is possible with horse cultivation, and the cost of production is reduced accordingly.

March Plantings

As soon as the ground is dry enough to work and the harrowing has been completed, a sowing of early peas should be made. An inch is generally considered about the right depth, and a quart to each 100 feet.

Onion sets may be planted except in the extreme north, for early supplies of bunch onions. Hand planting is best, in that it insures every bulb standing squarely upon its bottom, but this is slow and tedious if any great quantity is to be planted. For bunch onions a shallow furrow may be opened with the garden tractor, with the plow set to leave the furrow bottom sloping upward from the "land." If the sets are scattered along the bottom of this furrow they will have a tendency to right themselves sufficiently so the crooks will be neither many nor extreme.

If the perennial rows in the garden do not include horseradish, this may be planted this month, three inches deep, a cutting to every foot. But keep them in a section of the garden by themselves, for they will spread in every direction unless carefully restricted by thorough digging back every season after they get started.

A row or two of asparagus for plants may be sown. They will produce one-year crowns for next spring if well cultivated. But don't attempt to make commercial plantings of asparagus if you are growing strawberries unless you have an unlimited supply of pickers for the berries and cutters for the "grass." For the harvesting of these two crops comes on, continues and ends during the same period.

Hotbed and Cold Frame

Eggplant, peppers, early cabbage, some more tomatoes and early cauliflower will be seeded in flats or in the hotbed, the seed four or five to the inch in rows two inches apart. They can make good growth before it will be necessary to prick out in bands.

The tomatoes from the flats will need to be transplanted this month, two inches apart each way, in the hotbed, so as to be ready

to go into the bands in April. This transplanting increases the prospect of early tomatoes at higher prices.

The temperature in the hotbeds will need watching on sunny days, and ventilation given by raising the sash. Or alternate sash may be slid up at the top and down at the bottom, allowing a current of cool air to circulate through the bed. But watch the thermometer.

Order Your Fruit Plants

If you have not placed your order for small fruit plants this should be no longer delayed. And be sure to get inspected plants from some nursery that specializes in the production of disease-free stock.

More raspberries are being planted this year than in many years previous. This may be due to the fact that small fruits brought a fairly satisfactory price last season as compared with the prices obtained for peaches and apples, with the result that many orchardists are making extensive plantings of small fruits to insure greater income in the next few years. This condition necessitates a word of caution.

Most of the small fruits were marketed in 1931 before the real break in fruit prices happened, and the cause was not so much the volume of fruit as the general financial breakdown which intensified in early fall.

There will be no lack of small fruits of every kind on the large terminal markets in 1932 from present plantings. Also, it is quite likely the prices will not rise to the levels of 1931, but will be more apt to be comparable to the prices that prevail now on apples and citrus fruits.

Hence wisdom will dictate that the grower survey his possible market outlet before planning extensive new fruit plantings of any kind. If in doubt, make a trip to the city to which you plan to ship your crop, and talk with dealers and commission merchants there. If the outlook appears encouraging you can then proceed with a clear conscience. But if otherwise, it will be best to plan to produce no more than your local market will be able to absorb.

Grasshoppers Pest in 1931

THE UNUSUALLY severe outbreak of grasshoppers in the West during the summer was the outstanding insect pest activity of 1931, according to Dr. C. L. Marlatt, Chief of the Bureau of Entomology, in his annual report.

These grasshoppers, Doctor Marlatt points out, did not swarm in unexpectedly from afar, but, as predicted by entomologists, the numbers always present in the Great Plains area increased tremendously because of conditions caused by the severe droughts of 1929 and 1930. These conditions were favorable for the insects' growth but unfavorable for the diseases and other natural agencies that normally check the pests.

Unfortunately, the two measures known to be effective against grasshoppers—destroying the egg masses by cultivating the ground, thus exposing them to winter weather, and poisoning the young hoppers—were not taken, and the hordes of insects soon became uncontrollable except at a prohibitive cost. Eternally hungry, grasshoppers readily devour poison bran, along with any other food in their path. Unless poisoned while very young, they soon migrate over so wide a territory that poisoning becomes very costly. The Bureau of Entomology has made the necessary surveys and perfected plans to give all the assistance possible in meeting the outbreak of grasshoppers that will probably occur in 1932 unless conditions this winter destroy most of the eggs.

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Many excellent books have been produced in the past that have served to assist man in his battle with the insects and diseases that feed upon the fruits of the soil. But the publication, in 1928, of Mason's great work represented the greatest forward step in bringing together all existing information on crop pest control methods.

Not only is the author a specialist in the subjects upon which his great work treats, he is also familiar with the multitudinous problems of fruit production in all its aspects, being the owner and operator of upwards of 100 acres of orchard plantings.

"*Spraying, Dusting and Fumigating of Plants*" deals not only with strictly control problems, but covers also the problems the grower encounters with his materials and equipment in applying the control. Pumps and power plants, tanks, trucks and spraying accessories, the most economical utilization of equipment and labor and water, the location of and remedy for engine and pump troubles; these are but a few of the subjects so important to the grower that are understandingly treated.

The diseases and insects preying upon fruits, vegetables and field crops are described and the nature of injury illustrated so clearly that any grower will experience little difficulty in identifying any unfamiliar pest, and selecting the proper treatment for control.

Carefully worked out schedules are provided for each group of plants, by which the grower can apply preventive measures for major crop pests.

HOW YOU CAN USE THIS BOOK

Suppose, for example, that you grow apples. Some of them fall to the ground while green; others ripen too early. Cutting several of these open you find a worm near the core, at the end of a large burrow which is partially filled with frass or refuse.

Steps to Follow

- ① Identify the insect.
- ② Habits and life history.
- ③ Find what spray to use.
- ④ When to apply the spray.
- ⑤ Does it fit in with control of other pests?

For information on control materials refer to chapters on insecticides, fungicides, and dust.

Spraying and dusting schedules, like the one for apples (below), accompany the chapters on peaches; pears and quinces; plums and prunes; cherries; citrus fruits; grapes; and raspberries, blackberries and dewberries.

GENERAL SPRAYING AND DUSTING SCHEDULE FOR APPLES			
WHEN TO SPRAY	SPRAYS TO BE USED	SPRAY MATERIAL TO USE	NOTES ON APPLICATION
1. Just before buds open.	1. Bordeaux mixture.	1. 100 lbs. per acre.	1. Apply at rate of 100 lbs. per acre.
2. Just after buds open.	2. Bordeaux mixture.	2. 100 lbs. per acre.	2. Apply at rate of 100 lbs. per acre.
3. Just before fruit set.	3. Bordeaux mixture.	3. 100 lbs. per acre.	3. Apply at rate of 100 lbs. per acre.
4. Just after fruit set.	4. Bordeaux mixture.	4. 100 lbs. per acre.	4. Apply at rate of 100 lbs. per acre.
5. Just before harvest.	5. Bordeaux mixture.	5. 100 lbs. per acre.	5. Apply at rate of 100 lbs. per acre.

The new, 1932 edition of "*Spraying, Dusting and Fumigating of Plants*," just off the press, has been reduced in price from \$5.00 and may now be secured for only **Three Dollars**, postpaid. The thousands of growers who purchased the former edition of this book at the higher price were well repaid for their investment. The great demand for this book makes possible a lower price and places this valuable volume within reach of all.

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AMERICAN FRUIT GROWER
SQUABS

Page 33

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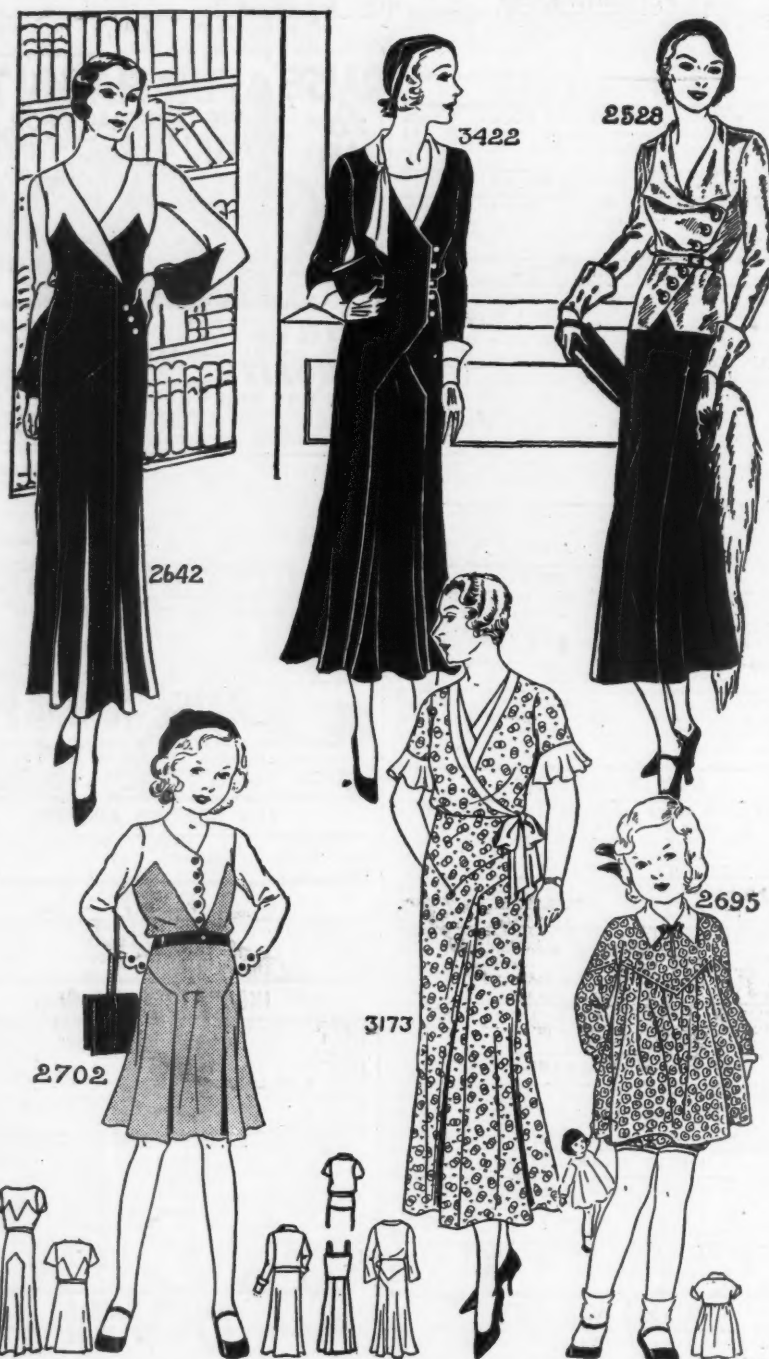
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Patterns may be secured by mail, postage prepaid, at 15 cents each from FASHION DEPARTMENT, AMERICAN FRUIT GROWER, 200 Fifth Avenue, New York, N. Y. Be sure to state size required. Enclose 10 cents additional for copy of Spring Fashion Magazine (15 cents where no pattern is ordered).

THE YOUNG DEWBERRY

By Harry B. Tabor

THE YOUNG DEWBERRY, which resembles a blend of the dewberry, the raspberry and the Loganberry, in the season of 1931 moved well forward into first rank in demand among the various varieties of berries offered on roadside and other markets of the South, especially in Arkansas. Indeed, in that State the raspberry and the Youngberry have both proved so popular that growers of these berries do not care for any publicity in this field, for in this instance at least the old adage may well be paraphrased into, "the fewer, the merrier!"

One or two growers of the Youngberries may, however, be mentioned, without fear of dire consequences. Arenson Brothers, farming along the main highway in central Arkansas, near Mayflower, planted a number of Youngberry vines in 1930, and these bore heavily, producing berries of the very best quality last year, for which a ready sale was found at the side of the road under an open shed.

J. A. Bauer, of Judsonia, Ark., one of the foremost strawberry growers and fanciers in the entire South, had a number of Youngberry vines. The past season he secured from these a yield of 200 crates to the acre, which sold at prices ranging from \$3.50 to \$4 per crate.

Youngberry plants are best set out in the fall. Fall set plants will bear a good crop the following spring, a maximum crop the second season, and will continue in good bearing for nine or 10 years. The Youngberry is served fresh like the strawberry, or it may be put up, canned, preserved, etc., in any way permissible with other small fruits. It lends itself readily to the farm program of the strawberry grower as the Youngberry comes on for harvest just at the close of the strawberry season. It has been identified by the United States Department of Agriculture as a hybrid between the Phenomenal and the Austin-Mayes dewberry.

Contrary to the idea advanced by some, the Youngberry is not a new plant. In fact, it was originated a quarter of a century ago—in 1905 to be exact—by B. M. Young, in Louisiana. It is grown commercially near Mobile, Ala., and in small tracts, as above mentioned, in Arkansas and other States.

The Youngberry is unusually free from the usual leaf diseases of brambles and from anthracnose, and makes a vigorous growth. It is subject to the double-blossom disease prevalent in the southeastern States, but to very few other diseases. The fruit is large, dark wine colored, sweet, and of excellent quality. The expressed juice seems even superior to that made from the well known Loganberry. The fruit is rather soft and its seeds are larger than those of the Logan. It is recommended in the United States Department of Agriculture bulletin, entitled, "Culture of the Loganberry and Related Varieties," for thorough trial from Maryland west to central Missouri, and south to northern Florida and east Texas, and may also be tested in all parts of the Pacific Coast region wherever the Loganberry is grown successfully.

From its rapid advance in popularity in Arkansas the past two years, the Youngberry is due for extensive increases in acreage in that State another year, and may soon rival the strawberry in acreage in Arkansas, and thus become another "Million dollar berry crop" for Arkansas, easily doubling the annual profits of its strawberry growers.